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N.G.A.A. APRIL 15, 1943 MEETING

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the OIL AND GAS JOURNAL

published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE ST., TULSA, OKLAHOMA

Subscription price, United States and foreign, 1 year, $6.00; 2 years, $10.00; 3 years, $12.00; 5 years, $15.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Entered as second-class mail matter at Tulsa, Okla., under Act. of March 3, 1879. Copyright 1943, by The Petroleum Publishing Co.

Vol. 41, No. 49 April 15, 1943

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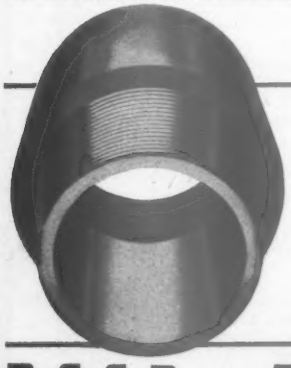

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the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States—Page 148

CRUDE PRODUCTION 3,933,810 bbl. daily average—up 3,555 bbl. One year ago 3,439,850 bbl.

CRUDE STOCKS 239,864,000 bbl. as of April 3—up 738,000 bbl. One year ago 261,768,000 bbl.

GASOLINE STOCKS 93,409,000 bbl. as of April 3, down 670,000 bbl. One year ago 106,406,000 bbl.

RESIDUAL FUEL-OIL STOCKS 67,483,000 bbl. as of April 3—down 455,000. One year ago 81,953,000 bbl.

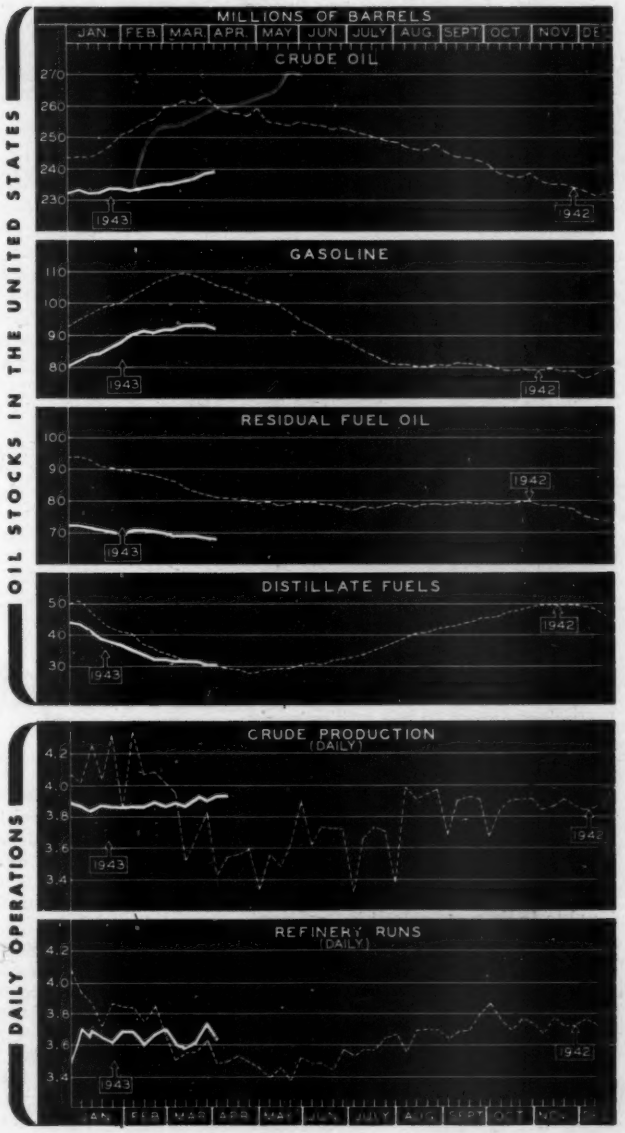
GAS OIL AND DISTILLATES 30,732,000 bbl. as of April 3—down 248,000. One year ago 30,095,000 bbl.

REFINERY RUNS 3,624,000 bbl. daily week ended April 3—down 118,000. One year ago 3,499,000 bbl.

VETERAN operators are pointing out that one important phase of the much-discussed crude-oil production situation is not receiving the attention to which it is entitled. They refer to the cooperative efforts and the pooled facilities in the oil country which normally are responsible for the drilling of thousands of wells annually including hundreds of wildcat tests. Within the oil-producing states there is a well-established and orderly procedure to which lease brokers, consulting geologists and engineers, drilling contractors, large and small producers, bankers, and supply companies contribute. There is no standard method of operation in carrying on these activities which will vary from well to well.

A REPRESENTATIVE operation would be one in which independent landmen who in many cases are small producers of crude oil, block leases in a promising area based on information obtained from consulting geologists who usually obtain part or all of their pay as a participant in the project. Other producers including major operators purchase leases or participate in the actual drilling of tests in some other manner. Drilling contractors may take part of their pay in leases or other interests. In many cases the projects, before they are completed, include loans from bankers. Supply-company credit enters into the successful completion of much of this drilling.

THOSE most familiar with conditions state that this informal but highly important promotion and operating organization, peculiar to the oil country, is "falling apart" because there is not enough activity under the present restrictions in drilling, to maintain it. The fact that costs in these pooling practices have greatly increased under war conditions with posted prices for crude oil remaining at prewar levels is stressed as an important factor in the curtailment. It is contended that the higher prices are necessary in order to make exploratory and development operations more attractive to those who finance them. There are complaints that the government war agencies have no conception of how these important activities function and what is required to maintain them under war conditions. The difficulties that lease men and geologists have in getting sufficient gasoline for their field work is a case in point. Finally it is contended that if these operations are permitted to completely disintegrate the oil country will lose its most important method of finding oil.



Way to Lift Crude-Oil-Price Ceiling Still May Be Open to Industry

by Henry D. Ralph

WASHINGTON, D. C.—A possibility appeared this week that a way to lift the crude-oil ceiling still is open to the administration despite President Roosevelt's executive order on prices and wages issued April 8.

Rep. Wesley Disney, Tulsa, after conferring with Prentiss M. Brown, price administrator, said that because Petroleum Administrator Ickes' recommendation on crude-oil prices reached OPA before the president's executive order was issued, may qualify the proposal for consideration. OPA, Representative Disney said, is giving the PAW recommendation sympathetic consideration.

From other sources, Mr. Disney said, he had learned that PAW requested a crude increase higher than the 25 cents per barrel asked by PIWC and possibly as much as 50 cents. He expressed belief, however, that OPA action should not be expected for some time but that he is optimistic about the eventual outcome of pleas for higher prices to stimulate exploration and discoveries.

Some See Hope Nullified

Other observers, who did not share Representative Disney's optimism, feel that the president's executive order prohibiting higher prices and wages, nullifies for a considerable time, the possibility of a crude rise.

The president's order of April 8 directs the price administrator to "authorize no further increases in ceiling prices except to the minimum extent required by law."

Another loophole is open for oil producers to prove that higher crude prices are necessary "to stabilize the national economy, to maintain and increase production, and to aid in the effective prosecution of the war," but it is unlikely that oil producers will be able to demonstrate this to the satisfaction of the Office of Price Administration and the Office of Economic Stabilization without considerable effort and probably a long delay.

The request for an over-all increase in crude prices which was submitted to the Petroleum Administration for War by the Petroleum Industry War Council some 2 months ago has now been referred to the OPA with the comments and recommendations of PAW. This much was told to the council by Administrator Ickes at the April meeting here last week, but all who heard his remarks were pledged to strict secrecy. It is believed that Mr. Ickes did not give much detail regarding the PAW attitude on crude prices, but hints were dropped to the effect that the industry would not be displeased with the report.

Independent Group Recalled

One report, strictly unverified, however, was that PAW had recommended an increase in crude-oil ceilings of 35 to 40 cents per barrel.

Similar statements, under the same pledge of secrecy, were made by Mr. Ickes to a group of members of the Crude Oil Requirements Committee who met with him at his invitation last week. This group had previously been rebuffed by the administrator when it called on him by appointment to discuss crude prices and other production problems. At the first meeting Mr. Ickes told the group he would not discuss the price situation until he had received from the PAW staff a report on the PIWC's request for higher prices. On Wednesday he told both this group and the council that the report had been transmitted to OPA for action and disposition.

Even without President Roosevelt's latest executive order no action on crude prices could have been expected for some time. The request must be studied by the OPA petroleum and other specialists and then go to Administrator Prentiss M. Brown and then to Stabilization Director James F. Byrnes. Because of the politics of the economic situation these officials could not be expected to approve an increase in the price of oil at this time, no matter how good a case could be made out on the facts involved. The administration currently is attempting to block the efforts of the coal miners and other labor groups for higher wages and of the farm bloc for higher farm prices, and its case would be seriously weakened by approval of higher prices for a basic commodity like oil.

Oil producers, however, refuse to admit defeat and plan to continue to press for higher crude prices on the ground that production and discovery cannot be maintained at present prices and that the war program will suffer before long on this account. Such an argument may meet the approval of the administration in due time, but no favorable action should be anticipated until some time after settlement of the controversies over food prices and miners' wages.

Investigators to Hear About Price

WASHINGTON, D. C.—Two congressional investigations of current petroleum problems, both probably giving considerable attention to the price of crude oil, were scheduled to open this week with prospects that they might continue concurrently for several days.

The petroleum subcommittee of the House, headed by Rep. Clarence F. Lea of California, planned to hear representatives of the Petroleum Administration for War and later spokesmen for oil industry in another of its periodic hearings for the purpose of keeping informed on the current situation and what the Government is doing about it. First hearings were scheduled for April 13.

The special House committee on small business, headed by Rep. Wright Patman of Texas, had earlier scheduled hearings to start April 14 on problems confronting small operators in the oil industry, particularly producers.

That the price of crude would be the chief topic of discussion at both investigations was apparent from the statements of witnesses and questions of committee members when the Lea committee opened its hearings Tuesday. Russell Brown, counsel of I.P.A.A., the first witness, reviewed

briefly the need for more oil production and the problems facing producers. He soon got on the subject of price and was questioned at length regarding the need for an increase, administrative machinery to obtain it, legality under the president's recent executive order, effect on consumers, use of incentive bonus as alternative, and related aspects. Mr. Brown said it is inconceivable that the president's order was intended to prevent increased production of a material essential to war, but if it should operate thus the president should be asked to correct it.

Similar questions were put to William R. Boyd, Jr., who followed Mr. Brown. Independent producers scheduled to discuss various production problems before the Lea committee included H. B. Fell, Ardmore, Okla.; George Morgan, San Angelo, Tex.; Harold F. Thompson, Dallas, Tex.; Donald P. Oak, Tulsa; L. Moffitt, Shreveport, La.; George Holbrook, Wellsville, N. Y.; J. B. Coleman, and C. P. McGaha, Wichita Falls, Tex.

California Buyers Adjust Crude Postings Upward to OPA Limits

LOS ANGELES, Calif. — California refiners last week approved the recent action of OPA in raising heavy oil ceilings and officially posted higher crude-price schedules effective April 1.

Coincident with the increase in heavy grades of crude oil, a 25-cent advance was made in both grades of fuel oil, Pacific Specification 300 and 400 and all grades of asphalt were increased $1.40 per ton. The increase in fuel oil and asphalt will be effective in Arizona, California, Nevada, Oregon and Washington as well as in Alaska and the Hawaiian Islands. The only disconcerting feature in connection with these price rises on heavy products is the OPA inference that a reduction in gasoline prices might be made upon conclusion of a survey now under way.

Operators of heavy crude-oil properties will now be able to undertake postponed but necessary remedial work out of current revenues. All that remains is to make available the necessary drilling and producing material and change some of the provisions of PAO 11 as it stands.

Production Exceeding Demand

Production in California has been exceeding the current demand for the past few months and it is quite likely that a minor change may be made in crude-oil allotments within the next 30 days. It may be another 30 or 60 days before any general effect of the price increase is felt in the heavy crude-oil fields because operators will not realize any additional income until some time in May when payments are made on April deliveries. Many operators upon being advised late in March that prices were going up on heavy crude discontinued deliveries after March 26 in order to take advantage of better prices.

About 35 per cent of California crude-oil production will be affected by the price adjustment although only 14 and 15-gravity oil secured the maximum increase of 25 cents per barrel. The effect of the new price on certain natural-gas contracts is not clear although several, including Kettleman Hills, are based on the fuel-oil price at Los Angeles.

Higher California Crude Ceiling Made State Wide

WASHINGTON, D. C.—Advances in maximum prices of California heavy crude oil, previously applied to 20 specific fields, were extended to a state-wide basis April 12 by the Office of Price Administration.

Ceilings were established at the receiving tanks in other California fields producing heavy crude at former maximums plus additions ranging from 1 to 25 cents per barrel, depending on gravity. Maximum price for a particular gravity, OPA's latest action provides, must not be less than that for a lower gravity from the same seller's tank in the same pool.

Turner Valley Crude-Oil Price Advanced 15 Cents

An increase of 15 cents per barrel in the posted price for Turner Valley crude oil, effective April 1, has been made by Imperial Oil, Ltd.

Basic prices under the new schedule will be $1.50 per barrel for 33 to 33.9-gravity crude, increasing 2 cents for each degree gravity to a top price of $2.12 for crude oil of 64 gravity or over. The price of natural gasoline remains unchanged at $2.28 per barrel for 26 Reid vapor pressure. Turner Valley crude averages around 43 gravity, for which the new price is $1.70.

Unitization Plan Covering Federal Lands Is Proposed

WASHINGTON, D. C.—A tentative regulation covering unitization of drilling for oil and gas on public lands has been issued by the U. S. Geological Survey for comment by the industry.

In the past, unit plans for development on public lands have been considered individually by the U.S.G.S., and the tentative regulation is proposed to set up general standards for considering such plans in the future. Interested parties are invited to submit comments within the next 60 days, and a public hearing may be held if there are sufficient objections to warrant this before the regulations are put into effect. The tentative regulation was published in the Federal Register of April 10.

The complete explanation of the unit plan and a proposed form covering such operations contains several thousand words, requiring seven pages in the Register which is available from the Superintendent of Documents, Government Printing Office, Washington.

Bell Purchases Pampa Properties From Ohio Oil

The Bell Oil & Gas Co. of Tulsa announced last week that it has purchased 480 acres of producing properties from the Ohio Oil Co. in Gray and Wheeler counties in the Panhandle of Texas.

The Bell has already taken over the operation of these properties and surveys are being made for further development and additional wells are expected to be drilled on these leases. There are 12 wells on the properties with some 360 acres undeveloped.

PIWC Postwar Study to Start With Assembly of Facts

WASHINGTON, D. C.—Development of the necessary factual information needed as a basis for the study will be the first concern of the Petroleum Industry War Council's subcommittee on postwar problems, William R. Boyd, Jr., council chairman, announced last week. Offices for the subcommittee have been opened in the Union Commerce Building, Cleveland, Ohio, under the direction of the chairman, Paul Ryan.

Personnel of the subcommittee has not yet been entirely settled, it was reported.

Larger Tank-Car Pool Allows WEP To Increase Crude-Oil Runs

by Paul Reed

THROUGHPUT jumped last week to more than 225,000 bbl. daily as the tank-car pool serving War Emergency Pipelines, Inc.'s 24-in. line was increased. The 10,492-car pool available for WEP service at the end of last week represents practically double the 5,700-car total of March 27. Action was necessitated by conditions described in "Failure to Furnish Tank Cars Restricts WEP Throughput," in The Oil and Gas Journal, April 8, 1943. The expanded car pool means that for the first time since the WEP, Longview-Norris City crude-oil line went into operation about 2 months ago, the system has a sufficient number of tank cars to send shipments to East Coast points at a daily rate equalling the monthly schedule.

The April schedule of approximately 5,800,000 bbl. of oil shipments calls for movement at a rate of more than 190,000 bbl. daily. Shipments fell considerably below that average during the early part of this month.

Now that shipments via the Ohio Oil Co. pipe-line system have been stepped up from 40,000 to 55,964 bbl. daily and the tank-car movement direct from Norris City has been attaining the 180,000-bbl. mark, giving a total of 225,000 bbl. daily for most of last week, this large throughput is still much below the 325,000-bbl. minimum capacity indicated for the line by certain 24-hour tests at the end of March. During the past week only half of the WEP pump stations were in operation although all of them are ready.

Total shipments over last week end from the Norris City terminal including movements both through the 14-in. line to Ohio Pipe Line at Enfield, Ill., and by tank car directly eastward were as follows: April 10, 219,199 bbl.; April 11, 251,214 bbl.

Tankage Limits Operations

The time during which WEP can ship at maximum rates is limited by a present shortage of tankage in East Texas. The system is already drawing on stored oil at Longview. And it appears that the present pool of 10,500 cars may be sufficient for actual transportation needs for the next week or two. But some time soon, according to those studying the situation, enough additional cars should be furnished the WEP pool to test the maximum capacity of the system and of railroad facilities for moving oil eastward from the loading racks. At least there should be a 3 or 4-day period with scrapers in the line to determine the maximum capacity of the WEP system.

Construction and operation of WEP loading racks has been efficient and more than adequate at all times. The bottleneck has been lack of sufficient empty cars to load. The 75-car trains of tank cars move in and out of the Norris City loading racks with no apparent congestion. At present the traffic is handled by two loading racks. A third rack recently finished is reserved solely for No. 2 heating-oil service when shipments of this product start next month. Experience may show eventually that 1,200 cars are the maximum that can be put through the Norris City terminal in a day.

Five of the sixteen 80,000-bbl. tanks for the Norris City terminal have been completed and a sixth is nearly finished. Work is progressing on other tanks. With seven tanks it is believed possible to take care of batches of heating oil planned for next month.

The Allied Oil Terminal organization, which now has a small terminal on the Illinois Central Railroad at Gale, Ill., for handling barge shipments coming up the Mississippi River, is building a loading rack and four 55,000-bbl. tanks to be ready in June. These will be available in case WEP needs them for peak loads.

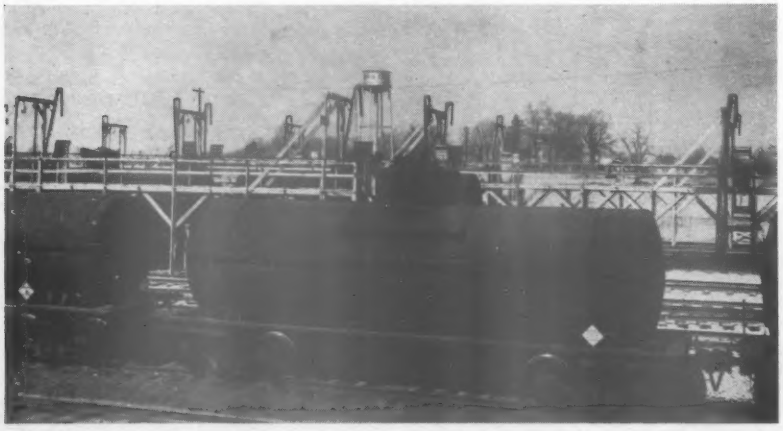
Rate of Shipments Rises

Last week shipments of WEP crude oil from the Norris City racks were: April 4, 750 cars; April 5, 600; April 6, 749; April 7, 675; April 8, 750, and April 9, 824; April 10, 750, and April 11, the best day so far with 899 cars.

Reports last week end indicated that empty cars were rolling into Norris City at record-breaking rates. Furthermore, substantial reductions have been effected in turnaround time which is now said to average under 11 days; with 7 days to Pittsburgh, 9 to 10 days to Philadelphia and 10 to 11 days to the New York-New Jersey refining area.

Shipments from War Emergency Pipelines, Inc., to eastern refineries for April are scheduled as follows:

Consignee—	(Bbl.)
Atlantic Refining Co.	900,000
Cities Service Oil Co.:	
From Norris City direct	150,000
Via Ohio line	300,000
Gulf Oil Corp.	495,000
Sinclair Refining Co.:	
From Norris City direct	600,000
Via Ohio line	105,000
Standard of New Jersey	1,425,000
Socony-Vacuum Oil Co., Inc.	300,000
Sun Oil Co.:	
From Norris City direct	600,000
Via Ohio line	300,000
Tide Water Associated Oil Co.	600,000
Total	5,775,000



WEP increased its rate of loading at Norris City this week to 900 to 1,000 cars daily. The 75-car trains are loaded in less than 2 hours from time of arrival

THIS WEEK

PRICES— Because PAW Ickes filed crude-price recommendation with OPA BEFORE president's anti-inflation decree, some see possible escape, contend ceilings could be lifted LATER without violating White House ruling. . . . Majority, however, fear crude is frozen, for the time being, along with other commodities, regardless of most forceful arguments. . . . BECAUSE the policy of keeping miners' wages within Little Steel formula, farm prices in line, would become multiply more difficult, IF oil-price lid is tilted. . . . ¶Higher prices for heavy California crudes, originally confined to 20 specified fields, extended to all other similar oils in the state. . . .

TRANSPORTATION— Tank-car shipments to East Coast set all-time record, averaging 912,919 bbl. daily. . . . Pool of cars assigned to WEP transshipment service now totals around 10,500 cars. . . . WEP deliveries, via rail and into Ohio Oil Co. line, averaging more than 225,000 bbl. daily. . . . ¶PAW accepting inquiries from other shippers for possible participation in West Texas "big inch" outlet. . . . Mills, contractors, available manpower now engaged on 24-in. extension and authorized 20-in., leaving ample time for more complete study of West Texas proposals, either east or west. . . .

MANPOWER— Shortage of technicians increasingly acute, at major refining centers. . . . New selective-service policy threatens to amplify previous drains on oil industry's manpower. . . . Programs for training women replacements generally accepted as most acceptable, possibly permanent, answer. . .

PRODUCTION— PAW will modify rules, or grant exceptions, allowing development of oil sands found later in condensate fields, such as Macedonia and Dorcheat, in Arkansas; Katy, in Texas. . . . Crude shortages are too imminent to support arbitrary rejection. . . . ¶Earthen dikes, possibly built by war prisoners, may protect Cumberland field, southern Oklahoma, from Red River Dam flood waters. . . .

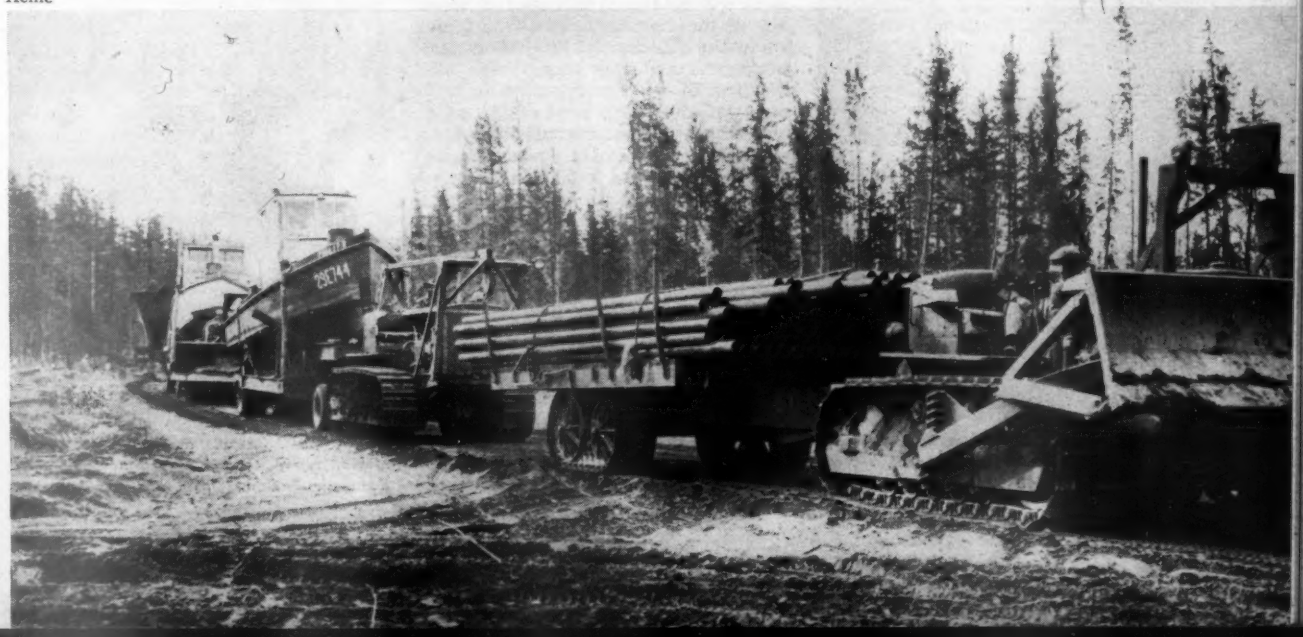
REFINING— Supplemental judgment in U. S. v. Standard of New Jersey, makes certain catalytic patents available to all, at reasonable royalty rates. . . . ¶Another catalytic-cracking unit starts operation, at Port Arthur, Tex., producing aviation gasoline. . . .

SUPPLIES— East Coast stock decline arrested, slight upturn registered. . . . PAW hastens to warn that current index of 30.5 per cent of normal inventory is critically low, cites long pull ahead this summer, to be ready next winter. . . . ¶Military secrecy blamed in Congress for hampering industry's ability to meet contingencies. . . . Question coming down to one of defensive security or offensive potency, whichever is best, military must decide. . . .

NATURAL GAS—Tentative approval given three construction projects, requiring 130,000 tons of steel. . . . Biggest calls for 26-in. loops along Panhandle Eastern system, enhancing deliveries to Detroit and Ohio war-industry centers. . . . Another Hugoton field outlet, crossing Kansas to Kansas City area, receiving favorable consideration, not yet formally approved. . . . ¶Technicians progressing with worth of liquefying hydrocarbon components of natural gas, on economic basis, for production of aviation-grade ingredients. . . .

REGULATIONS—U.S.G.S. issues proposed blanket unitization form, covering public-land exploration. . . . Industry invited to comment. . . . Public hearings may be held, if interest justifies, before plan is ordered into effect. . . . If preannouncement serves purpose, inspires constructive criticism, results in eradicating "bugs" before order is issued, procedure may establish precedent for other agencies. . . .

First pictures released on the construction of a pipe line from Fort Norman, in the Canadian Northwest, to Whitehorse, Alaska, on the Alcan Highway, include this shot of a strange convoy. Tons of equipment, including pipe, construction machinery, boats and miscellaneous facilities were moved 16 miles by "cats" over the portage road between Fitzgerald and Fort Smith to avoid Pelican Rapids
Acme



Exploration Groups Discuss Means of Meeting Nation's Wartime Oil Demand

by W. V. Howard

FORT WORTH, Tex. — Over 1,100 geologists and geophysicists met at the Texas Hotel here last week at the Wartime Conference of the American Association of Petroleum Geologists, the Society of Exploration Geophysicists and the Society of Economic Paleontologists and Mineralogists. Officers elected for the coming year by the A.A.P.G. were A. R. Denison, Amerada Petroleum Corp., Tulsa, president; R. W. Clark, Western Gulf Oil Corp., Los Angeles, Calif., vice president; R. E. Rettger, Sun Oil Co., Dallas, secretary-treasurer, and Carey Croneis, University of Chicago, editor. These officers, together with Fritz L. Aurin, Southland Royalties Co., Fort Worth, the retiring president, make up the executive committee.

The executive committee of the S.E.G. consists of R. D. Wyckoff, Gulf Research & Development Corp., Pittsburgh, Pa., president; Frank Goldstone, Shell Oil Co., Inc., Houston, Tex., past president; William Rust, Jr., Humble Oil & Refining Co., Houston, vice president; Hart Brown, Brown Geophysical Co., Houston, secretary-treasurer, and J. A. Sharpe, Stanolind Oil & Gas Co., Tulsa, editor.

R. D. Wyckoff, Gulf Research & Development Corp., newly elected president, Society of Exploration Geophysicists

The paleontologists and mineralogists elected J. Harlan Johnson, Colorado School of Mines, Golden, Colo., president and R. Dana Russell, San Diego, Calif., on leave from Louisiana State University, vice president. Reelected were H. B. Senzel, University of Texas, secretary-treasurer, and the society's two editors, J. Marvin Weller, Illinois State Geological Survey, Urbana, and W. H. Twenhofel, University of Wisconsin, Madison. H. L. Driver, Standard Oil Co. of California, Los Angeles, is past president of the society.

Papers of General Interest

The A.A.P.G. program consisted entirely of papers of general interest dealing with exploration problems, the economics of exploration, the possibilities of secondary recovery and an appraisal of the wartime production possibilities of different sections of the country. The addresses of the retiring A.A.P.G. and S.E.G. presidents were presented in last week's Journal, together with Frederic H. Lahee's survey of wildcat drilling in 1942, L. F. McCollum's survey of the discovery rate in the central part of the country, and an extended digest of A. I. Levorsen's thought-provoking report on discovery thinking. Among other papers at the opening joint session of the three societies was a review of petroleum geology in 1942 prepared by the department of geology of the Colorado School of Mines under the direction of F. M. Van Tuyl, who presented the paper. This was the first of what is intended to be a series of annual reviews of the progress of geology and consisted of an account of publications, new and improved techniques and the significant events of the year concerned with petroleum geology.

K. C. Heald, staff geologist, the Gulf companies, Pittsburgh, Pa., reviewed the place of geology in World War II. He considered that use of geology by the American Army lags below that of European armies and even below the record of the U. S. Army in World War I. Geological knowledge is, however, proving of great assistance in the study of aerial photographs and in cartography. Geologists are also being used extensively both in the United States and in foreign countries in the search for strategic minerals and a number of important new finds have already been made. He criticized the maps being provided for army use by the U. S. Geological Survey and deplored the secrecy surrounding these maps which were probably less valuable than maps of the same areas already in the hands of the enemy. Oil companies which have done exploratory work in many foreign countries are being called on and are supplying maps of great military value, showing as they do almost every tree, house or outcrop on a large and easily usable scale.

Richard J. Gonzales, Humble Oil & Refining Co., Houston, discussed wartime changes in the petroleum industry. Following an outline of trends in drilling, reserves, production and various phases of refining and transportation, Mr. Gonzales discussed the existing price levels which he considered too low. OPA officials, he said, were basing their opinion of costs on the Tariff Commission's study. This, he considered, of very questionable validity if four major limitations and omissions are considered. In the first

J. Harlan Johnson, Colorado School of Mines, newly elected president, Society of Economic Paleontologists and Mineralogists

place, the Tariff Commission report compares prices and costs with 1939 which was a very unsatisfactory year with the lowest level of prices since the depression, with oil-company earnings low, whereas all industrial companies had better earnings than in 1937. Then the Tariff Commission report gives no consideration to a return on invested capital, so that if a return of 6 per cent on invested capital were allowed, resulting profits would be 5 per cent in Texas and less than 8 per cent in the United States. This he considered low in view of the risks involved. In 1937 he considered the profit margin to be from 12 to 15 per cent. Also, the Tariff Commission paid no attention to the increased cost of finding oil. If the amount spent for searching remained the same for the past few years, this cost could be considered to be doubled or tripled because of the great decline in new reserves found. Finally, the cost study failed to include information from many of the small producers. The average production of the wells on which cost data were secured was 13.6 bbl. daily whereas the total for all wells was about 10 bbl., making an average for those wells not covered by the report 7.8 bbl. or 43 per cent less than for those wells studied.

Transportation has also shifted so that differentials for location are often exactly opposite to the differentials in price. Selectivity of crude under war conditions also justifies local price increases. Based on advances recently permitted, Mr. Gonzales gave it as his opinion that general levels should and would be raised selectively rather than by means of blanket increases.

E. DeGolyer, whose resignation as assistant deputy petroleum administrator for war has been announced, spoke on the discovery problem. He pointed out that present production of crude could be advanced between 400,000 and 500,000 bbl. daily, although this increase would come mainly from West and Southwest Texas and the Gulf Coast where transportation difficulties are already great and much of the crude is of undesirable quality. Moreover, the increase would be only temporary, he said, with a decline which would place the total output for 3 or 4 years at about the existing level. He estimated that the nation will need every barrel of its producing capacity by the end of this year or the first quarter of 1944. The need for new discoveries is disclosed, he said, by the fact that half of the oil now being produced comes from fields discovered since 1930.

Mr. DeGolyer criticized existing reserve estimates saying that the proven reserve might be as high as 30,000,000,000 bbl. or 50 per cent above present figures. This, he said, did not mean any more available oil. He reviewed published later figures for fields discovered in recent years and said that the average increase is 175 per cent above estimates made at the end of the calendar year in which the fields were found. This addition made to discoveries in the past 2 years, however, will not balance output so that a great increase in the discovery rate is essential.

A.A.P.G. executive committee, elected at the Fort Worth meeting. Lower row, Fritz L. Aurin, Southland Royalty Co., past president; A. Roger Denison, Amerada Petroleum Corp., president; R. W. Clark, Western Gulf Oil Corp., vice president. Upper row, R. E. Rettger, Sun Oil Co., secretary-treasurer; and Carey Croneis, University of Chicago, editor

W. B. Heroy, director of reserves, PAW, also discussed reserves pointing out that not only was the discovery rate declining but that the flush production from new wells drilled in 1942 was only 12 per cent of that of 1937. Exploratory work is proceeding at a high rate, he said, but successes were not so great. Moreover, the industry is suffering from an acute lack of manpower in the exploration departments.

At a symposium on secondary recovery and stripper wells, George R. Elliott, Phillips Petroleum Co., Bartlesville, Okla., discussed the geologic factors in unitized pressure maintenance, Jones sand reservoir, Schuler field, Arkansas. Mr. Elliott's paper will be published in an early issue of The Oil and Gas Journal. Paul D. Torrey, consulting engineer, Houston, discussed general principles of secondary recovery, George H. Fancher, University of Texas, spoke on the engineering phases of secondary recovery and R. C. Earlougher, Geologic Standards Co., Tulsa, on criteria for determining an oil field's susceptibility to secondary recovery Paul D. Fitzgerald, Dowell Incorporated, Tulsa, discussed the new method of permeability measurement developed by his company and its applications to the selective acidization of wells. C. P. McGaha, Fain & McGaha, Wichita Falls, Tex., concluded the discussion with a paper on the importance of the stripper well. Mr. McGaha estimated the number of such wells to be 300,000 or 73 per cent of the total number in the United States. These wells produce about 15 per cent of the nation's daily production with an average of 1.9 bbl. per well per day. They have reserves of nearly 4,000,000,000 bbl. of which 1,400,000,000 bbl. can be produced by primary methods and 2,600,000,000 bbl. by secondary recovery. Here the controlling factor is almost entirely economic which practically confines secondary recovery to shallow operations. Mr. McGaha considers that the number of abandonments of stripper wells under our present system of controlled economy and artificial price ceilings to be increasing at an alarming rate, amounting to an estimated 12,000 in 1942. This is an increase of 50 per cent above abandonments in 1938. He said that under a free economy, operators frequently continued operations at a loss, expecting an eventual price increase. That incentive is now gone with the result that many leases are prematurely abandoned.

Mr. McGaha considers the only solution to the problem of the stripper well operator to be an increase in prices.

State Capitals

ARKANSAS

THE OIL AND GAS COMMISSION has fixed the daily production allowable for the state's oil wells for May, June and July at 72,340 bbl. with all but one field receiving the same allowable as at present. The allowable for the Jones sand pool of the Schuler field was cut 1,000 bbl. daily to 11,000 at the request of the unit operator. Controlled fields were allowed 46,344 bbl., controlled gas fields 1,696, and unprorated fields 24,300 bbl.

OKLAHOMA

THE CORPORATION COMMISSION, upon application of Peerless Oil & Gas Co., has reopened the Hugoton gas-field case and another hearing is scheduled April 16.

CALIFORNIA

WHEN PRESIDENT ROOSEVELT last week transferred authority over Cerritos channel in the Los Angeles Harbor district from the War Department to Interior, it marked the beginning of a new battle involving tideland ownership in California and the probability that Ickes department will attempt to negotiate government leases.

Cerritos ship channel runs through the most productive part of the Wilmington field in an east-west direction and some wells are already bottomed beneath or very near the boundary of the channel itself. A few months ago a court decision ruled in favor of the federal Government against Union Pacific Railroad Co., and in view of this decision it is likely that the Government's title to ownership of the channel will be ultimately upheld.

The result of litigation may set a precedent applicable to tideland permits issued by California, notably at Elwood, Rincon and Huntington Beach.

ATTORNEY GENERAL KENNY of California in an opinion rendered this week has held that Assembly Bill 589 amending the 1911 grant of tidelands to the city of Long Beach is legal. The amendment provides that the city of Long Beach may use revenues from tidelands for certain roads and flood control. The opinion which was written by Deputy Attorney General R. S. McLaughlin of Los Angeles does not cloud the city of Long Beach's title but suggested that the city of Long Beach alter its charter.

SOUTH DAKOTA

A MEASURE creating an oil and gas conservation board to control exploratory work and possible production in South Dakota was approved by the legislature at its 1943 session and signed by the governor.

The board will be composed of the governor, attorney general, secretary of state, state treasurer, commissioner of school and public lands and the state auditor. The state geologist and the state engineer will serve in an advisory capacity.

The board will have authority to regulate all oil and gas exploratory work but the measure specifically limits its authority with the provision that it shall have "no jurisdiction to make rules, regulations or orders which restrict or limit production of petroleum, oil or gas in the absence of waste."

The measure establishing the board provides that no wells shall be drilled closer than 200 ft. from any adjacent property line or 500 ft. from another well on the same property. This provision does not apply, however, to core test wells or stratigraphic wells.

The law also provides that the board must be notified of plans for drilling of wells and sets a fee of $25 for each well. If a well-drilling application is denied, a hearing must be granted to the applicant within 20 days after the application is made and the decision must be announced within 25 days. All decisions of the board can be appealed to circuit courts in the state.

The law also provides that well-drilling applications must carry the exact location of the proposed well, the names and addresses of the owner, operator, contractor and driller and that the well log, drilling records, samples of cuttings or cores must be filed with the board within 6 months after the well is completed.

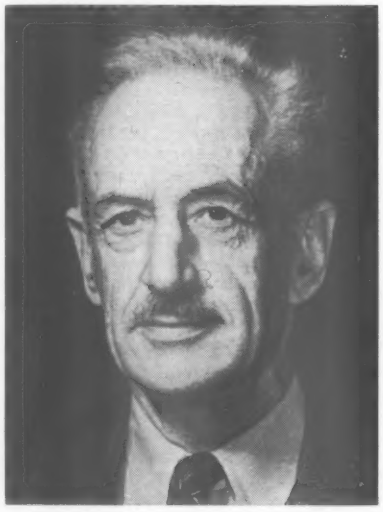
The board must also be given notice of the intention to drill stratigraphic tests and a plugging report must be filed 60 days after the test is completed. No fee is required, however.

The legislature also passed a measure appropriating $25,000 for the payment of a bonus for the first successful South Dakota oil well but the bill was vetoed by Gov. M. Q. Sharpe.

Also approved by the legislature and signed by the governor were measures requiring more detailed oil and gas leases for filing with county registers of deeds, including the post office address of the owner and the legal description of the land, and requiring surrender of oil and mineral leases 15 days after they expire.

Drilling of four wells was started last summer and work is expected to be resumed on at least some of them this spring.

ILLINOIS ENGINEER



Frederick Squires, Urbana, Ill., has been a member of the Illinois State Geological Survey staff since 1936. He did temporary work for the survey from 1931 to 1933. He is the author of an article on "The Principle of the Safety Cylinder as an Explosion Preventer in Air-Gas Compression" appearing on pages 83, 84 and 93 in the April 8 Journal. He has been active in development of fiber pipe as an emergency alternate for steel. Mr. Squires went to Illinois in 1914 after 10 years of structural engineering work in New York. He first became interested in secondary-recovery improvements, partly for his own firm of Squires Brothers and partly as field managing partner for the Dinsmoor Oil Co. and the Remlik Oil Co.

TEXAS

THE RAILROAD COMMISSION has revised its ruling concerning the length of time producers and refiners must keep copies of reports and forms filed with the commission. Formerly these duplicate records had to be kept indefinitely, but under the new order operators are only required to keep them 2 years after the date of filing. The operator can use his discretion about the disposal of the records at that time.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Weak Link in Oil Chain

IT is now possible at the end of the first quarter of this all-out war year to examine the petroleum chain of operations and determine where the strength and where the weakness lie.

The several links devoted to the manufacture of war products are strong and getting stronger. There is every reason to believe that by the end of the year there will be sufficient aviation fuels, special lubricants and toluene to meet peak military demands of the Allies as now projected.

Petroleum's part in synthetic rubber, under the abbreviated plan to supply the military and the essential civilian needs, will be a completed accomplishment in another 9 months. Greater output for other civilian uses will follow.

The ordinary refinery operations — just as important in the total war effort as the extraordinary —despite many changes in practices are keeping pace with immediate demands. In crude-oil production total supplies for the first quarter slightly exceeded domestic, lend-lease and exports demands.

It would, of course, be dangerous to assume that all the war problems of crude-oil production and refining have been solved. There are local excesses and deficiencies in supplies and the industry does not have and will not have soon the transportation facilities to level off these hills and valleys brought about by war conditions.

But generally the steady reductions in storage, which extended through most of 1942, have ended. Greater demands are assured later this year, but a well-directed and executed program should bring further improvement in this operating balance.

Unfortunately, as most links of the oil chain have strengthened, the main link has weakened. The reports showing 3,750 completions this year up to the start of this month reveal what is wrong. These completions represent a 26 per cent decline from the first quarter of last year, and it is necessary to go back to the bottom of the depression period of the early thirties to find comparable inactivity in drilling operations.

The inevitable result is a continuance of the condition so apparent last year in which additions to reserves from new discoveries trailed far behind current production. Furthermore, the dearth in drilling has brought apparent declines in the productivity of many undeveloped fields. Total drilling is running behind the reduced schedule outlined by the Government at the start of the year. Wildcatting is about half the program which seeks to find more new oil than is produced.

Thus we have a condition in which the oil business is doing a remarkable job in adjusting all of its aboveground operations to war requirements but the feed line to the underground reservoirs is gradually being closed. The stream that feeds the power dam is drying up.

The industry's explorationists at Fort Worth last week gave the only possible answers to this matter of repairing this subsurface link which is the only guarantee that the entire chain will perform satisfactorily throughout the emergency. It is a matter of price, materials, and manpower supporting those activities which have found the required oil in the past.

No "hold the line" order should be interpreted to mean that nothing can be done. If new laws are the only way out—and it is not yet certain that is the case—let's have them quickly.

Eastern Producers Show Need for Higher Crude Prices at Pittsburgh A.P.I. Meeting

by J. P. O'Donnell

PITTSBURG, Pa.—The prediction that there would be a "national crude-oil shortage within a year," made by Ralph T. Zook, president of the Sloan & Zook Co., Bradford, Pa., and a strong recommendation for an increase in the price of crude oil to forestall that impending shortage, voiced by Gov. Edward Martin, of Pennsylvania, featured the annual meeting here last week of the American Petroleum Institute's eastern district Division of Production.

Governor Martin addressed the division's dinner meeting. He showed not only the need for an increase in crude prices but also cited justification for an increase. The need is apparent from the fact that "an army without oil, today, is a defeated army. A navy without oil is a useless navy. Vital as oil is in war, badly as it is needed, the price of crude today, by comparison, is lower than that of any other vital raw material.

"In November 1941, using 100 as a basis, farm products sold at a little above 90 and in November 1942 at a little above 110. Metal products on the same dates were about equal at 103. Food in November 1941 was a little above 89 and in November 1942 a little above 103. Petroleum in November 1941 was a little above 60 and remained at that level in November 1942.

"The record for retail commodity prices for the same dates shows about the same picture. Food in November 1941 was a little above 92 and in November 1942 a little higher than 106. Clothing in November 1941 was a little more than 79 and in November 1942 was 88½. Gasoline in November 1941 was a little above 66 and a year later, November 1942, a little above 68. In brief the present price of petroleum is clearly out of comparison with other commodities used by Americans in the war effort."

Mr. Zook's prediction of an imminent crude-oil shortage came at the conclusion of an unusually frank exposition of the problems which this country and others of the United Nations face in the war with the Axis powers. Mr. Zook recently completed an intensive 4-week course in geopolitics at the U. S. Army Command and General Staff School at Fort Leavenworth, Kans., and his observations were based on his education there.

Any possibility of a quick end to the war as the result of an invasion of western Europe by American and British forces was discounted completely by Mr. Zook. He gave data on the volume of shipping now available to the United Nations and other figures on the volume necessary to transport and supply an army of sufficient size to engage German and satellite armies on continental European battlefields. At the conclusion of this summary he said: "It is obvious that the war's end in 6 months is impossible." He also discounted the much discussed possibility of cargo planes making up the deficiency in seagoing carriers because of the planes' tremendous fuel and personnel requirements.

Registration Off 20 Per Cent

Registration for the meeting totaled 421, off about 20 per cent from a year ago, but 544 attended the dinner to hear Governor Martin. The governor was presented by S. A. Vockel, president, Waverly Oil Works Co., Pittsburgh. M. G. Gulley, Gulf Oil Corp., retiring chairman, presided at the dinner and first session; Virgil F. Bowyer, Peoples Natural Gas Co., at the second, and R. B. Anderson, Columbian Carbon Co., at the final session. W. E. Ferguson, Ohio Fuel Gas Co., Columbus, Ohio, was elected chairman for the coming year.

Frank A. Watts, director, Materials Division, PAW, described the functioning of the Controlled Materials Plan, the last of a series of plans to effect a desirable division of available material. He said that since the PAW was the claimant agency for the oil industry it was highly desirable that the industry give PAW the utmost cooperation so that it could secure its rightful share of available material as one of the essential industries. Jack Jones, who replaced Justin Wolf, PAW assistant chief counsel, on the program, explained some of the differences between M-68 and its successor, PAO 11. He said that while supplements to M-68 were designed to relax restrictions, any supplements to PAO 11 will probably have the effect of tightening them. Any operations conducted in com-

District 1, Petroleum Administration for War, officials, who attended the meeting in Pittsburgh: J. A. R. Wylie, director of production; R. S. Hyde, analyst; Henry W. Fuellhart, assistant director of production, and Frank M. Brewster, director, Natural Gas and Natural Gasoline Division

pliance with PAO 11 automatically qualify under CMP. He predicted that the supplementary order applying to Indiana, Illinois and Kentucky will be superseded soon.

In a paper prepared by himself and Paul H. Price, West Virginia state geologist, R. C. Tucker of the West Virginia Geological Survey spoke encouragingly of future oil and gas supplies in the East. Most of his talk was confined to West Virginia and the adjacent areas of neighboring states. He foresaw additional possibilities of Clinton sand production and noted indications of success in Newburg sand wells, possibly deepened from the Oriskany. He said that there are about 60 repressuring projects, some using excess Oriskany gas, in West Virginia and added that one experimental flood is being carried on with good results.

Dr. F. H. Dotterweich, consultant in the PAW Natural Gas Division, reported on war products from natural gas and natural gasoline in a paper prepared in collaboration with Paul Raigorodsky. Authors reviewed the potential uses of these products as source material for aviation-gasoline components, synthetic rubber, plastics, alcohol and explosives. (See paper by same authors in the N.G. A.A. Section of this issue, p. 94.)

Gen. William C. Rose, chief of executive services, WMC, said the problem in manpower was the assignment of 18,500,000 to war industry and 11,000,000 to the armed forces. This year will find it necessary to move over 2,000,000 into war industry and 4,000,000 into the armed forces, a total of roughly 6,500,000. In view of this great need he asked for industry's cooperation in Manpower Commission requests. He said, significantly, women are new being used in heavy industry, such as steel and shipbuilding, and "certainly oil can do no less than these two."

H. J. Wagner, chief, Gas Section, West Virginia Public Service Commission, predicted a serious shortage of natural gas in the industrial East this coming fall and winter. He said that about 50 per cent of the Appalachian supply comes from West Virginia which gets 47 per cent of its gas from the Kanawha-Jackson Oriskany field. This Oriskany supply is limited because the field is defined on three sides and the sand is erratic on the fourth and by the fact that these wells decline rapidly. Low profits have virtually eliminated the independent, as drilling permit declines show, thereby also eliminating much of the normal wildcatting. Only an immediately inaugurated drilling program and connections with southwest fields will prevent a shortage in the east this year.

Carl V. Spangler, of J. F. Pritchard & Co., spoke on standby fuels in industrial plants, principally liquefied petroleum gases and natural gasoline as alternatives for natural gas. He recommended the installation of sufficient storage capacity to accommodate several days' supply since interruption in natural-gas service was most likely in short periods of severe cold when peak demands are encountered. The fuel-oil shortage, he said, had added substantially to the demand for liquefied petroleum gases.

A brief forum on material conservation practices included reports from Harry Wines, district superintendent, West Virginia Gas Corp.; J. J. Schmidt, superintendent of production, East Ohio Gas Co.; John T. Galey, geologist, and D. J. Henecker, wire-rope division, Jones & Laughlin Corp. Suggestions were:

Mr. Wines—Use of old casing for line pipe, reconditioned boiler tubes in field gathering systems, and the use of the more economical spudders instead of standard rigs for drilling to depths of 6,000 ft.

Mr. Schmidt—Completion of Clinton sand wells with only surface pipe and tubing in the hole (one company saved 700 tons of steel on 30 wells at a cost of $7,500 in Aquagel and labor), centralizing of tanks and separators to reduce the number in use.

Mr. Galey—Drilling of wells in hollows when possible because of shallower depths and usually better availability of water; use of wooden derricks; shortening of belt houses and preparation of hypothetical logs before drilling so that only essential amounts of casing will be needed.

Mr. Henecker—Lengthening wire-rope life by avoiding socketing errors; aligning sheaves; leading line correctly through dividers; careful drilling motion; careful slipping of line through short clamps; care in lowering tools; avoidance of overloading and protection against corrosion.

Right: Three representatives from Forest Oil Co., Bradford, Pa.: William Shcemaker, Mr. Snyder and Paul M. Phillipi

Below: Velair C. Smith, Charleston, W. Va.; Dr. C. R. Fettke, Carnegie Institute of Technology, Pittsburgh, Pa.; Dr. R. L. Sherrill, Universtiy of Pittsburgh, Pa., and Gordon Gulley, Gulf Oil Corp., retiring chairman, eastern district, Division of Production, A.P.I.

Federal Order Digest

OPA Regulations

Petroleum — RPS 88, Amendment 91: Alters discount provisions of original schedule to: (1) Sellers must allow discounts no less favorable than those allowed during the 60 days prior to the base pricing date; (2) discounts cannot apply to specific dollars-and-cents prices; (3) deliveries pursuant to contracts entered into more than 60 days prior to October 15, 1941, ruled not to be discounts; and (4) the base price period is changed from October 1-15, 1941, to 60 days prior to October 15 to include a sufficient number of transactions, effective April 16.

Fuel Oil — MPR 137, Amendment 30: Specifies that maximum gasoline prices established by OPA apply to any liquid fuel to which gasoline taxes apply with exception of aviation gasoline of 87 octane or higher, effective April 12.

Fuel Oil—MPR 137, Amendment 31: Establishes 0.3 cent higher margin for kerosene, range oil, No. 1 heating and Pacific Specification 100, in specified territory, effective April 2.

Crude Oil — RPS 88, Amendment 88: Extends higher ceilings on low-gravity crude to all California fields, including 20 specified in Amendment 87 issued March 26, effective April 12.

Petroleum — RPS 88, Amendment 89: Allows 0.3 cent per gallon maximum above other ceilings determinable by the order on tank-wagon sales in lots of 260 gal. or less for all grades of fuel oil, in specified territory, effective April 2.

Reclaimed Lube Oil—Requires any re-refiner or marketer selling re-refined lubricating oil for use as fuel oil to apply for approval of a tentative maximum price with OPA, effective April 7.

Machinery—MPR 136, Amendment 76: Establishes alternative ceiling for used machinery and second-hand machine parts, based, in general, on standard depreciation rates, allowing some sellers higher prices than existing maximums, effective April 6.

Machinery—MPR 136, Amendment 78: Creates new methods for producers and suppliers of machinery and services to obtain price adjustments, effective April 10.

Renegotiation—Provides new forms for financial and cost statements by contracts, issued April 7.

Manila Rope—MPR 204, Order 12: Sets maximum price for sales of rope by consumer-holders to Metals Reserve Co., pursuant to WPB's Recovery Program RD-47, effective March 22, issued April 9.

WPB Regulations

Sheet Steel—PRO M-45, amended: Eliminates reference to Order P-76, continues requirement that steel-drum manufacturers set aside a specified inventory of hot or cold-rolled sheet steel to make drums under specific order of WPB, effective April 8.

Sheet Steel—PRO P-76: Revoked.

Excess Materials—PR 13, amended: Tightens control over materials held as idle, excess or frozen goods by persons who are not regularly engaged in the business of selling such materials, effective April 7.

Controlled Materials—CMPR 3, Direction 1: Extends assistance until June 30, on orders which have already been placed by dealers, distributors and jobbers who are permitted to extend priorities ratings under terms of CMPR 3, as amended, to prevent discrimination against their rated orders to which allotment numbers have not been applied, issued April 7.

Transportation — PRO P-142: Implements acquisition of materials needed for the operations of transportation systems, providing medium for obtaining maintenance, repair and operating supplies, effective April 5.

Transportation—PRO P-88, revoked, effective April 5.

Transportation — GLO L-229, revoked, effective April 5.

Reports — PR 8, amended: Eliminates requirements for reports on any of the 43 forms listed in Appendix A, effective April 3.

Auto Repairs—LO L-270: Restricts the manufacture of various items used in the repair and maintenance of automotive vehicles, effective April 30.

Office Supplies — CMPR 5, Interpretation 1: Permits use of preference ratings assigned under CMPR 5 for obtaining office supplies, excluding paper and paperboard products, machinery, molded pulp products and printed matter, effective April 6.

Manpower Regulations

Selective Service — Eliminates dependency as a cause for deferment for men with collateral dependents and wives only, drastically revamps selective-service classifications, sets up general pattern for local boards in reclassifying registrants, issued April 12.

Rationing Orders

Gasoline—ODT 21, interpretation: Rules that certificates of war necessity and T ration coupons cannot be transferred along with titles to trucks or other commercial vehicles, requiring new owners to file new applications.

Oil Tank-Car Unloading Plans Involve Huge Outlay

WASHINGTON, D. C.—Plans for the immediate construction of almost a million dollars worth of unloading facilities in the East to speed the turnaround of tank cars carrying oil to the Atlantic seaboard were announced April 3 by Joseph B. Eastman, director of the Office of Defense Transportation.

Work already has begun, Mr. Eastman disclosed, at Tremley, N. J., on one of the projects which are planned at 23 terminals from Norfolk, Va., to Portland, Me. Completion of the projects—if all are approved—is expected to increase the daily handling capacity of the terminals by more than 950 tank cars.

Part of the program has been approved by the War Production Board. Other phases of the program will be considered by WPB soon.

Final agreements have been signed for the largest phase of the program—railroad improvements at four points along the line of the Central Railroad of New Jersey at a cost of approximately $615,500. These projects will be at Tremley, Carteret, Sewaren, and Bayonne, N. J.

Completion of the construction projects will require varying periods, ranging from 2 to 10 weeks, after work begins. It is expected that the improvements already begun along the Central Railroad of New Jersey will be completed next month.

The 950-car increase in the daily handling capacity of the terminals will add a total of approximately 200,000 bbl. a day to the unloading potential in the East.

Twelve New Oil Tankers Launched During March

WASHINGTON, D. C.—Twelve new tankers were included in the total of 146 new ships completed in March at various yards in the country.

Six of the new tankers were launched at Chester, Pa., by the Sun Shipbuilding & Dry Dock Co., two were completed by Kaiser Co., Inc., Swan Island, Portland, Ore. two by Alabama Dry Dock & Shipbuilding Co., Mobile, Ala., and two were finished by Bethlehem-Sparrows Point Shipyard, Inc., Sparrows Point, Mo.

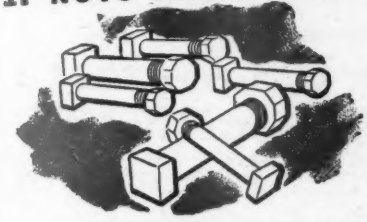
Welding piping with Tube-Turn fittings conserves 4 vital materials . . . checks war-time pipe failures, stops leaks!

NO. 4 OF A SERIES

HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

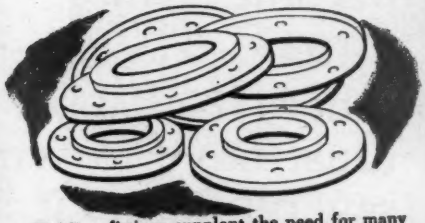
The FIRST WELDING FITTINGS 1st AND STILL THE BEST

1. NUTS AND BOLTS



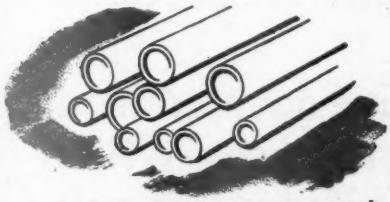
Joints welded with Tube-Turn fittings require no nuts or bolts. Maintenance time and trouble spent in tightening bolts is eliminated.

2. FLANGES



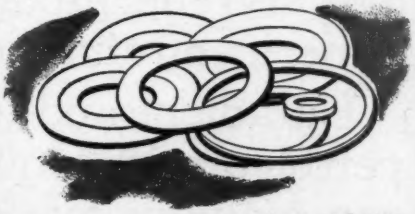
Welding fittings supplant the need for many of the flanged joints necessary in screwed piping—save both weight and critical metal.

3. PIPE REPLACEMENT



When welding fittings are used, you never have to replace any pipe because of worn threads or damage due to replacing flanged fittings.

4. GASKET MATERIAL



Fewer flanged joints mean fewer gaskets to replace. No materials or time wasted when connections are welded with Tube-Turn fittings.

When you multiply these savings over an entire piping system, the amount of critical materials conserved is tremendous. Tube-Turn welding fittings aid the war effort in *other* ways, too—less danger of plant shut-downs due to piping failures; maintenance is virtually eliminated; less installation time is needed because alignment is easier, only simple butt welds are required, and complete sections may be pre-assembled then welded into position. For *stronger, lighter, permanently leakproof* piping systems—weld with Tube-Turn fittings!

TUBE-TURNS (INC.) LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. *Distributors in principal cities.*

ARMY-NAVY E

TUBE-TURN

TRADE MARK

Welding Fittings and Flanges

Plants and Plantations

Plantations half across the world—that's where our peacetime rubber used to come from

Plants right here in the U.S.A.—that's where the rubber is coming from that we must have to win the war The first of several plants is already in operation

Plantation rubber is natural—it's made from the sap of a tree Plant rubber is synthetic—it's made from butadiene and styrene produced from crude oil in American refineries

Butadiene and styrene are derived from petroleum by Universal processes, which can make us forever independent of rubber plantations 10,000 miles from home

Do you think production of synthetic rubber will end with the war?

The oil industry never goes backward

OIL IS AMMUNITION—USE IT WISELY CARE FOR YOUR CAR FOR YOUR COUNTRY

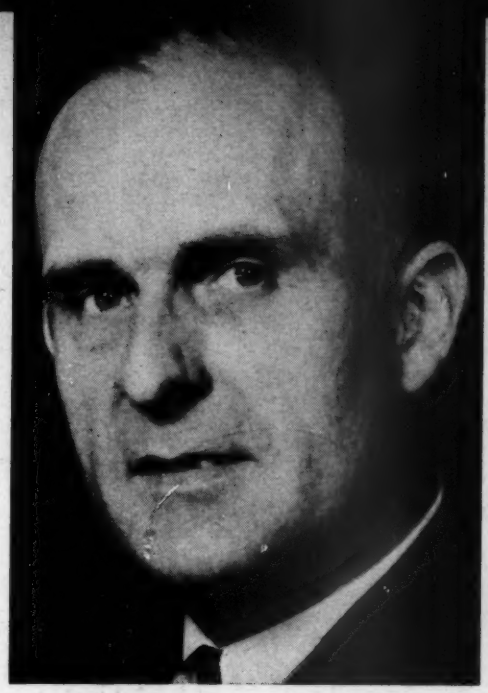
Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

THE REFINERS INSTITUTE OF PETROLEUM TECHNOLOGY

Oil Chemists Given Lead Roles at A.C.S. Annual Conference

by J. P. O'Donnell



Dr. Per K. Frolich, director of Standard Oil Development Co. laboratories, and president of the American Chemical Society, who presided at the annual meeting in Detroit.

DETROIT, Mich.—Oil men played a prominent part in the 105th national meeting of the American Chemical Society held here this week. One of them, Dr. Per K. Frolich, head of the chemical laboratories, Standard Oil Development Co., is president of the society and, as such, presided at the general sessions. Dr. George Calingaert, director of chemical research, Ethyl Gasoline Corp., is vice chairman of the meeting.

E. V. Murphree, vice president, Standard Oil Development Co., spoke on "The Petroleum Industry in the War Effort" at the central session Wednesday. The other speakers at this session were C. F. Kettering, director of research, General Motors Corp., and C. A. Thomas, Monsanto Chemical Co., who discussed the roles of their respective industries in the war program.

C. L. Brown, Standard Oil Co. of Louisiana, Baton Rouge, is chairman, and Dr. L. M. Henderson, Pure Oil Co., Winnetka, Ill., is secretary of the society's petroleum division.

Industry's Contributions

The most important contributions of the petroleum industry to the war effort have been the production of synthetic toluene, large quantities of high-octane aviation gasoline and synthetic-rubber raw materials.

As an example of the processes employed, Mr. Murphree cited the processing of the C_5 fraction which "may be converted into aviation gasoline through an alkylation process using fractionation or isomerization or both. As an alternate, the butane fraction after separation of isobutane may be catalytically dehydrogenated by successive steps to give butadiene. The C_5, C_6 and C_7 fractions may be used either directly in aviation gasoline or selected fractions of these cuts may be isolated by superfractionation and then used in aviation gasoline. The low-octane-number fractions discarded in the superfractionation may be isomerized if desired into higher-octane-number fractions. The fraction boiling from 250° to 290° F. contacts most of the potential as well as the actual C_7 and C_8 aromatic compounds such as toluene and xylenes. This fraction is preferably processed by hydroforming to convert potential aromatics into actual aromatics. The hydroformed material may be used either directly in aviation gasoline or the aromatics isolated by extraction. The heavy naphtha boiling from 290° to 350° F. can be subjected to severe thermal cracking or reforming to yield butadiene directly and other desirable materials. As an alternate, this fraction may be hydroformed. The gas-oil fraction, boiling from 350° F. to crude bottoms, is best processed by catalytic cracking to yield aviation gasoline and raw materials for synthetic rubber. As an alternate the lighter portion of this fraction can be subjected to severe thermal cracking to yield butadiene."

Mr. Murphree described some of the processes such as:

1. Superfractionation, used principally to isolate certain fractions which have higher octane number than others, particularly true of iso compounds.

2. Alkylation, by which isoparaffins are combined with olefins to give higher molecular-weight compounds of branched-chain structure, excellent aviation blending agent.

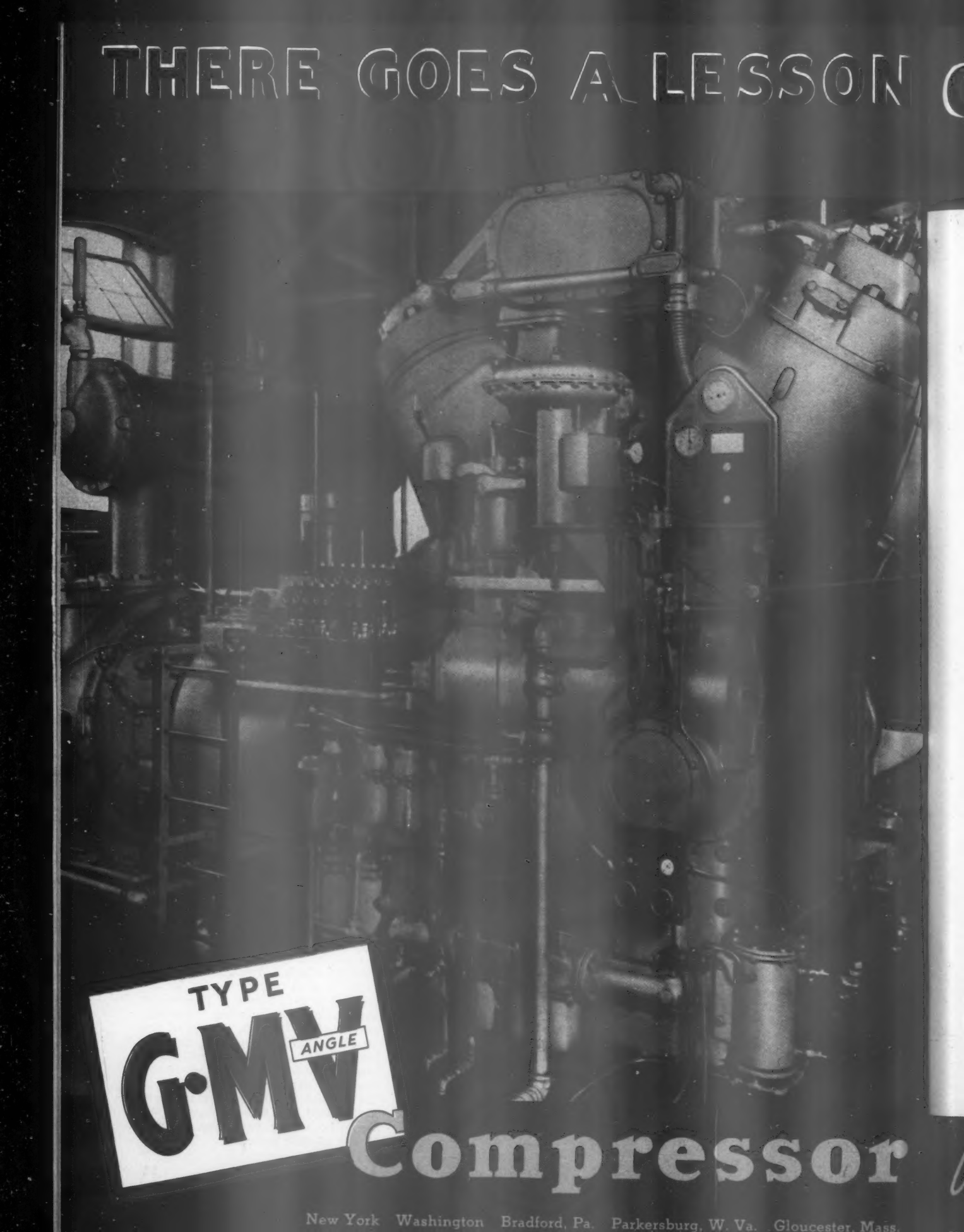
3. Isomerization, used principally for the conversion of normal butane to isobutane for alkylation. C_5 and higher straight-chain hydrocarbons can be isomerized thereby improving their antiknock value. Isopentane, isohexane and isoheptane are all valuable compounds for high-octane gasoline.

4. Hydroforming or catalytic dehydrogenation in the presence of hydrogen which is effective in converting normal paraffins of C_6 and higher molecular weight and six-carbon-atom-ring naphthenes into aromatic toluene may be produced from methyl cyclohexane and xylene from dimethyl cyclohexane. The first major application of this process has been for the production of TNT.

Abstracts of technical papers presented this week before the petroleum division of the American Chemical Society at Detroit, Mich., appear on pages 127, 128 and 129 of this issue.

Catalytic-Cracking Results

5. Catalytic cracking, three types of which are widely applied, is preferred to thermal cracking since the catalyst not only accelerates but also directs the course of the reaction to give higher-quality products and better yields of the desired products. In one type of catalytic cracking 100 bbl. of gas oil are charged plus 9.7 bbl. of isobutane to produce 5.9 bbl. of aviation gasoline which is considerably higher in octane number than existing requirements. For this reason it is possible to blend 21.5 bbl. of virgin naphtha which in itself is not of sufficiently good octane number for direct use to give a total of 78.4 bbl. of aviation gasoline meeting 100-octane specifications for each 100 bbl. of gas oil cracked. This operation involves alkylation of olefins and some further processing of a portion or all of the catalytic naphtha. In addition to the 78.4 bbl. of aviation gasoline there are produced 6.6 bbl. of heavy naphtha to be used in motor gasoline and 35 bbl. of cycle gas oil.



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GAS REFORMING

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REFINING

NATURAL GAS TRANSMISSION

COMPRESSING AIR AND GASES FOR OTHER VITAL WAR INDUSTRIES

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

PAW May Relax Arkansas Curbs

EL DORADO, Ark.—Hopes for lifting of federal restrictions to clear the way for an active drilling program in the Dorcheat and Macedonia fields of Columbia County, Arkansas, were raised this week following a state-wide hearing of the Arkansas Oil and Gas Commission with officials of the Petroleum Administration for War in attendance.

Final decision rests with PAW officials, but the Arkansas commission and District 3 PAW authorities will collaborate with operators in the two fields in preparing a definite program to be submitted to Washington.

O. C. Bailey, chairman of the Arkansas regulatory body, placed the commission on record as supporting the plea of operators for authority to drill more wells immediately following the hearing, and PAW engineers, together with engineers of the state commission and representatives of operators will prepare the recommendations.

D. E. Buchanan, Houston, Tex., director of PAW District 3, announced he would recommend a drilling program for the fields if he could assure the War Department that nothing would be allowed to impair the supply of gas for war industries in this territory. James E. Pew, Washington, deputy director of PAW's Natural Gas and Gasoline Division, participated in the hearing.

Last week's hearing resulted from refusal of federal authorities to grant additional permits for drilling of wells to develop the Cotton Valley oil pay of the fields. Drilling was halted recently and operation of purely oil wells in the areas was forbidden although operators and the state commission were of the opinion that authorization for such a program had been given by United States authorities more than a year ago.

It has been the contention of the PAW authorities that the entire program was predicated on the need of gas to supply war industries as drilling was started in search of sour gas that was found in the deep Smackover lime formations below 8,000 ft. The Cotton Valley production—oil and sweet gas—was discovered after the program had been started and the Arkansas commission allowed the dual completion of wells in the area in the lime and Cotton Valley zones to conserve the use of critical steel.

Chairman Bailey stated the position of the state body and urged development of fields until they are fully defined, calling attention to the desire of Arkansas to continue to contribute to winning of the war through development of the reserves of both oil and gas.

Warren B. Weeks, district geologist for the Phillips Petroleum Co., said the fields are largely undeveloped that present indications point to possible extensions of the proven area. He said only 57 per cent of the acreage has been developed and that on the basis of the reserve estimate the amount of oil that would be left in the reservoir without additional drilling would be approximately 25 million barrels. He called attention to the fact that due to the early spacing program in the areas prior to adoption of the 80-acre pattern, about 40 per cent of the wells are on about 10 per cent of the acreage.

Mr. Weeks said the field is divided about 50 per cent as to oil and gas production. He said three gas sands and two oil sands have been developed in the Cotton Valley formation in the Dorcheat area and eight gas sands and five oil sands in the Macedonia field. He said not a dry hole had been drilled to the Cotton Valley zone and compared the sands with those in the Schuler area.

Specific requests for additional oil, gas and distillate were made at the hearing. George Moore, manager of the pipe-line department of the Root Refining Co. of El Dorado, said his company is running short about 4,000 bbl. of crude daily, saying that the firm had been forced to withdraw crude from storage. He said the company has only about 1 month's supply left in storage. He added that the new high-octane gasoline plant will be completed in July or August and the company will be in need of additional crude.

John Howell, vice president of the Lion company, said his concern could use from 1,000 to 2,000 bbl. more crude daily for refining operations, for its high-octane plant and for the butadiene unit now nearing completion. C. M. Whitman of the Standard Oil Co. of Louisiana testified as to the need of 10,000 bbl. of distillate daily to help fill contracts with New Jersey refineries.

The Arkansas Fuel Oil Co. representatives, R. O. Garrett and E. P. Farmer, told of the need of 81 million cubic feet of gas daily for the pipeline serving the aluminum plant and other war industries and stated the company's gas-cleaning plant in the Macedonia area is scheduled to be completed at an early date.

Among officials meeting last week at Magnolia, Ark., were J. H. Alphin, Arkansas representative on the Interstate Compact Commission; D. E. Buchanan, director of PAW District 3; Alex M. Crowell, director of the Arkansas commission; O. C. Bailey, chairman; R. L. Carruthers, PAW engineer; James E. Pew, Washington, D. C., assistant director of PAW's Natural Gas and Natural Gasoline Division; Basil Hoag, R. S. Warnock, J. D. Reynolds, Bob Short and Ed Hollyfield, commissioners

Mexican Crude-Oil Production Showing Moderate Increase

AN increase of more than 3,700 bbl. in the daily average production from Poza Rica field in January stimulated output of crude oil from Mexican properties under management of Petroleos Mexicanos to a 4-month high of 74,610 bbl. daily. Poza Rica produced 55,775 bbl. of the January daily average output compared to 52,033 bbl. per day in December.

There has been a gradual rise in Petroleos Mexicanos production since the low of 67,820 bbl. daily in October 1942. The production figures do not include output of private independent companies still permitted to operate in Mexico.

The official report of Petroleos Mexicanos for last year shows that crude-oil production totaled 32,955,000 bbl. against 41,160,000 bbl. in 1941. In 1932 production was 32,805,000 bbl., the lowest since 1915 when it totaled 32,911,000 bbl. in a period of expansion that reached a peak of 193,308,000 bbl. in 1921.

The decline in production in 1942 was attributed in a large measure to the withdrawal of tankers since Mexico normally exports a large proportion of her production. The value of 1942 exports was set at $7,378,000 against $15,300,000 in the preceding year.

This decline in exports was offset to some extent by the growth of internal consumption which has been on the upgrade for years. The value of products consumed internally was 254,000,000 pesos (1 peso equals 20.7 cents) in 1942 which compared with 22,000,000 pesos for 1941.

Reserves Estimated

Petroleos Mexicanos also included an estimate of reserves in its report. These were estimated at 750,000,000 bbl. The report points out that this volume is "virtually 20 times greater than the average annual quantity extracted for both internal and external consumption in the last 5 years."

The report, marking the fifth anniversary of the expropriation of foreign oil companies, recognized the cooperation which the United States is providing. This cooperation, the report stated, is "duly appreciated by Mexico and must be regarded as helpful to the whole country, since the United States has been granting us priorities that allow us to purchase considerable quantities of equipment and raw materials indispensable to the operation and maintenance of our activities."

Daily average production for the last quarter of 1942 and the first month this year is shown in the accompanying table.

October 1942	67,820
November 1942	69,655
December 1942	71,213
January 1943	74,610

In January 1942, before impact of the war was felt fully in the Western Hemisphere, Petroleos Mexicanos production averaged 136,843 bbl. daily, or 62,233 bbl. higher than in the same month this year. The Poza Rica field produced 2,784,583 bbl., or 89,825 bbl. daily.

Lucien Craig Appointed Assistant Supply Chief

WASHINGTON, D. C.—Appointment of Lucien F. Craig as assistant director of the Division of Petroleum Supply was announced April 3 by Deputy Petroleum Administrator for War Ralph K. Davies.

Mr. Craig has resigned from the Gulf Oil Corp., where he served as assistant general manager of fuel sales, handling petroleum coke sales, fuel oil exchanges, purchases, and other supply and distribution problems relating to fuel and furnace oils in the Pittsburgh district and western states.

During the period of NRA, he served in Washington as secretary of the Board of Review of the Planning and Coordination Committee and as assistant to the national coordinator for refining.

In 1935, Mr. Craig joined the Gulf Oil Corp. with headquarters in Pittsburgh, a position he held until called to Washington by the PAW.

Walter Hochuli Becomes PAW Director of Marketing

WASHINGTON, D. C. — Walter Hochuli, new director of marketing for the Petroleum Administration for War, came to his government position from the Texas Co., of which he is territorial manager for 15 states, with headquarters in Chicago. He assumed his new duties April 12.

Starting as a Texas Co. salesman in New Jersey, he remained in the company's eastern district for 7 years, In February 1931 he went to the Indian Refining Co., Indianapolis, Ind., a subsidiary of the Texas Co., as assistant manager in charge of sales. He later became sales manager, remaining with the Indiana company until November 1934, when he returned to the parent organization as assistant territorial manager in Chicago. He became manager in January 1938. Since 1937 he has also been vice president of the Indian Refining Co.

He succeeds Robert T. Collier, who resigned recently after having completed the 6 months' period which he agreed to serve.

Two More Oil Firms Are Expropriated by Mexico

MEXICO CITY, Mexico—The last two United States-owned oil companies have been expropriated by the Mexican Government, these being the properties of International Petroleum Co. and International Oil & Pipe Line Co., which are owned by Sea board Oil Co. of Delaware. It is estimated that the value of the most recently taken properties was between $400,000 and $1,000,000.

DEATHS

Prentiss Seale, 52, of Oklahoma City, Okla., district manager of Oklahoma and Kansas for the Hughes Tool Co. for the past 18 years, died April 6 at Hays, Kans. Survivors include his widow; a son, Prentiss, Jr., 17; a daughter, Martha, 12; his father, who resides at Beaumont, Tex., and three sisters.

Timothy Spellacy Thurston, 49, a former oil-field worker, died at his home in Tulsa last week. Mr. Thurston moved to Tulsa from Lima, Ohio, in 1917. A brother and four sisters survive.

Robert F. Pentacost, 46, drilling contractor of Longview, Tex., was killed almost instantly last week when he was hurled 60 ft. from near the top of a derrick which he was assisting to dismantle, near Kilgore, Tex. The same accident also caused the death of **Edward E. Ellis,** 44, of Kilgore. Mr. Pentacost is survived by his wife, while the widow and a son survive Mr. Ellis.

James A. Bowman, 55, oil-well driller of Snyder, Tex., died in a Wichita Falls, Tex., hospital last week. A son survives.

Francis W. McKenna, 41, died in a hospital at Smethport, Pa., last week. He had been a patient for 2 months. He had been employed as an oil-field worker.

Walter B. Daniels, 62, a resident of Smethport, Pa., for 38 years, died at his home after a long illness. He had worked for Quaker State Oil Refining Co. for 13 years, retiring 5 years ago. His widow and four sons survive.

PIWC OIL'S EMBASSY AT WASHINGTON

by Henry D. Ralph

W. R. Boyd, Jr., chairman of the Petroleum Industry War Council and president of the American Petroleum Institute, heads the streamlined organization. He now resides in Washington to give full time to PIWC affairs

WASHINGTON, D. C. — Oil's embassy in Washington is the office of the Petroleum Industry War Council, a seven-room suite in the Commonwealth Building, 1625 K Street, Northwest.

Through this office clear virtually all the matters which affect the petroleum industry and its relations with the federal Government and with the war program. Here a small, streamlined organization, equipped for quick trouble shooting, maintains a constant liaison with Congress, the Cabinet, the Petroleum Administration for War, the Office of Price Administration, and the other emergency and regular administrative agencies.

The Petroleum Industry War Council is, as its name implies, an industry advisory committee. Its 72 members gather in Washington once a month and its many standing and special committees carry on activities in various parts of the country. But the headquarters office is on the job continuously, acting as a clearing house for oil problems and oil information.

Few industries in the country are as well organized for smoothing out their wartime relationships with the Government as is the oil industry. The PIWC has become, through a rapid evolutionary process, an agency for converting the industry to war, for gearing its divergent components into a unified mechanism, and for maintaining harmonious cooperation with the government regulatory agencies.

When the Petroleum Administration for War was first established (as the Office of Petroleum Coordinator) nearly 2 years ago, Secretary Ickes set out to create a partnership between Government and the oil industry to accomplish objectives which neither could achieve alone. Many projects required by defense plans and now by the war program could not be undertaken by the industry alone because of the antitrust laws unless specifically directed by the Government, and Mr. Ickes chose to work with and through the industry rather than by government fiat.

Originally Mr. Ickes appointed general industry committees and specialized committees for production, refining, transportation, marketing, and natural gas and natural gasoline in each of five geographical districts. This permitted industry specialists to tackle local and technical problems and make recommendations and suggestions. While this worked very well and still does, it was soon discovered that many of the committee members, while personally well qualified for their positions, could not commit their companies to any course of action.

This led to the creation of the Petroleum Industry War Council, composed of the policy-making heads of the major oil companies, the chairmen of the 30 district committees, the presidents of the several trade associations in the industry, and a number of outstanding representatives of independent operators. The council, which held its first meeting the day Congress declared war on Japan, has become the principal agency for conveying to the petroleum administrator the collec-

Allan H. Hand, secretary-treasurer of the PIWC, first went to Washington in June 1941 as consultant on petroleum matters to the OPA. In October 1941 he became assistant director of transportation for the OPC. Previously he had spent many years with Union Oil Co. of California

tive thinking of the oil industry toward war-born problems, and also the chief medium for carrying back to the industry the policies and decisions of PAW and other government agencies.

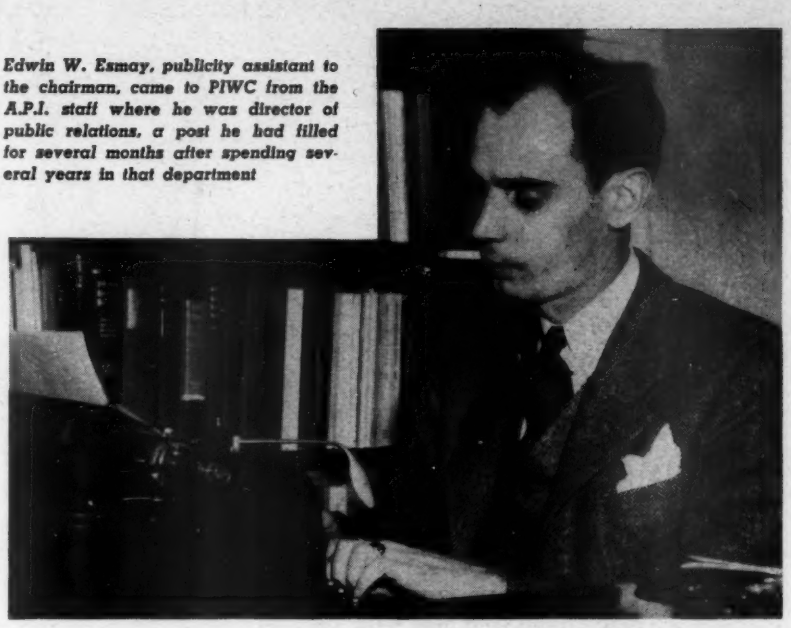
As its chairman, the council elected William R. Boyd, Jr., nationally known as president of the American Petroleum Institute. Within a few weeks Mr. Boyd found that his job was much more than presiding at a monthly meeting and it was necessary for him to move to Washington for the duration to keep in close touch with the nerve center of the United Nations. Now, the PIWC maintains a permanent office and staff, financed by voluntary contributions from the industry.

Attains Semiofficial Status

The council has become much more than simply an advisory body to the petroleum administrator. It has acquired a unique semigovernmental status. Its reports and recommendations are given great weight by many government agencies, and it is often asked to help administer government programs directed to the oil industry. It is constantly called on for information by the Government, the press, and the general public.

As chairman of the council Mr. Boyd has become recognized as the spokesman for the oil industry. In addition to being in constant contact with Administrator Ickes and the PAW staff, he is consulted by members of Congress and the heads of other government agencies and is frequently called to the White House when oil matters are under consideration. His job also includes keeping the many divergent segments of the oil industry working together as a team on war problems, and this involves a tremendous amount of correspondence, long-distance telephoning, and committee conferences.

"Bill" Boyd has a background of 24 years of experience in trade association work. He has the ability to compose differences between individuals and groups in the industry which have widely varying economic interests and views, and his impartiality has won him the respect and confidence of the industry and the Government. Radio Commentator Earl Godwin described Mr. Boyd as doing a high-powered public relations job for the industry—the best being done by anyone in Washington. A prominent oil executive recently remarked that "To handle a job like his requires a man who can walk over eggs wearing baseball shoes without breaking the shells."



Edwin W. Esmay, publicity assistant to the chairman, came to PIWC from the A.P.I. staff where he was director of public relations, a post he had filled for several months after spending several years in that department

The headquarters' staff works on a flexible, interchangeable basis. Like a circus where everyone doubles in brass, all hands pitch in when there is a job to be done.

Secretary-treasurer is Allen Hand, formerly with the Union Oil Co. of California and later with the Office of Price Adjustment. Office manager is H. G. Mell, brought in from a local business firm when the office routine grew too large for one man to supervise. The other two executives were loaned for the duration by the American Petroleum Institute—Joseph L. Dwyer, assistant to the chairman, whose principal job is relations with Congress and the executive departments, and Edwin W. Esmay, who handles relations with the public and the press.

Joseph L. Dwyer, general assistant to the chairman, is another recruit from the A.P.I. staff. Previous to organization of PIWC, Mr. Dwyer was Washington representative for the A.P.I. and in that capacity had numerous contacts with congressmen and federal bureaus.

Pressure Temporarily Off

The office is far less hectic than in the early days of the war, and particularly during the scrap rubber drive last summer, but there is plenty of work going all the time. An average of 100 local and long-distance incoming telephone calls are answered in an ordinary day, and the staff has never had time to keep track of its volume of correspondence. Getting out committee reports and other material for the council requires mimeographing some 25,000 sheets per month, and when the council gathers for its regular meeting and a dozen committees are calling on the office facilities at the same time, the staff goes on to a double shift and recruits extra help from all over the city.

The council's incoming mailbag is quite diversified, and contains all sorts of requests for information. A high school boy wants to know where he can study petroleum engineering; the owner of some prospective oil land wants advice on the procedure for getting it drilled; another man wants to know how he can serve the war effort in the oil industry. Requests for copies of reports issued by the council have been received from all sections of this and foreign countries.

DUST · ACID FUMES ·
· EXPLOSIVE GASES · DUST · ACID FUMES
DUST · E P S C F · CID FUMES
ACID FUMES · DUST · EXPLO E GASES
· EXPLOSIVE GA ES · AC D MES · DUST
ACID UMES · DUST · EXPLOSIVE GASES
DUST · Y L SI GA S A IT UMES
EXPLOSIVE GASES · DUST · ACID UMES
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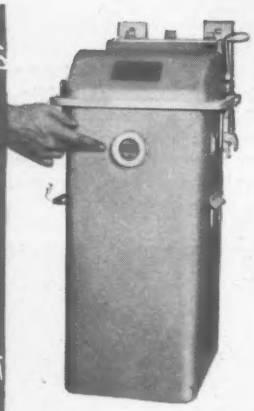
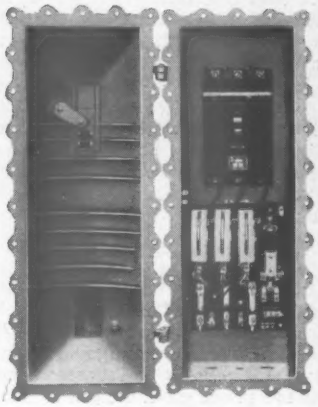
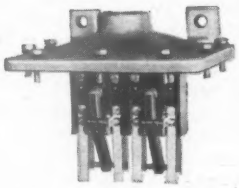


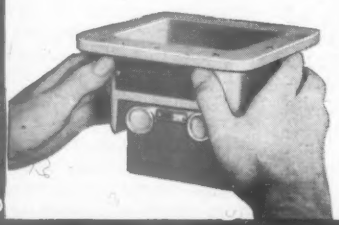
● Oil-immersed combination starter for Class 1, Group D, locations. All contacts are at least 6 inches under oil. Easy-to-read indicator provides safety check on oil level.

● Standard magnetic starter enclosed in cast-iron case for Class 1, Group D, application.



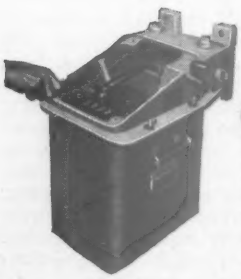


● Air-break combination starter—combining both a circuit breaker and a starter in one unit—for Class 1, Group D, locations. Complete unit is enclosed in a sturdy, cast-iron case.



● Oil-immersed, push-button station for both corrosive and hazardous-gas locations. All contacts are under oil, and entire unit is enclosed in cast-iron case.

● New high-voltage combination starter for 2300- and 4000-volt motors. Contactors are immersed in oil to prevent corrosion.



● Standard oil-immersed combination starter for corrosive locations. New, sealed-off head protects cable and terminals from oil fumes.

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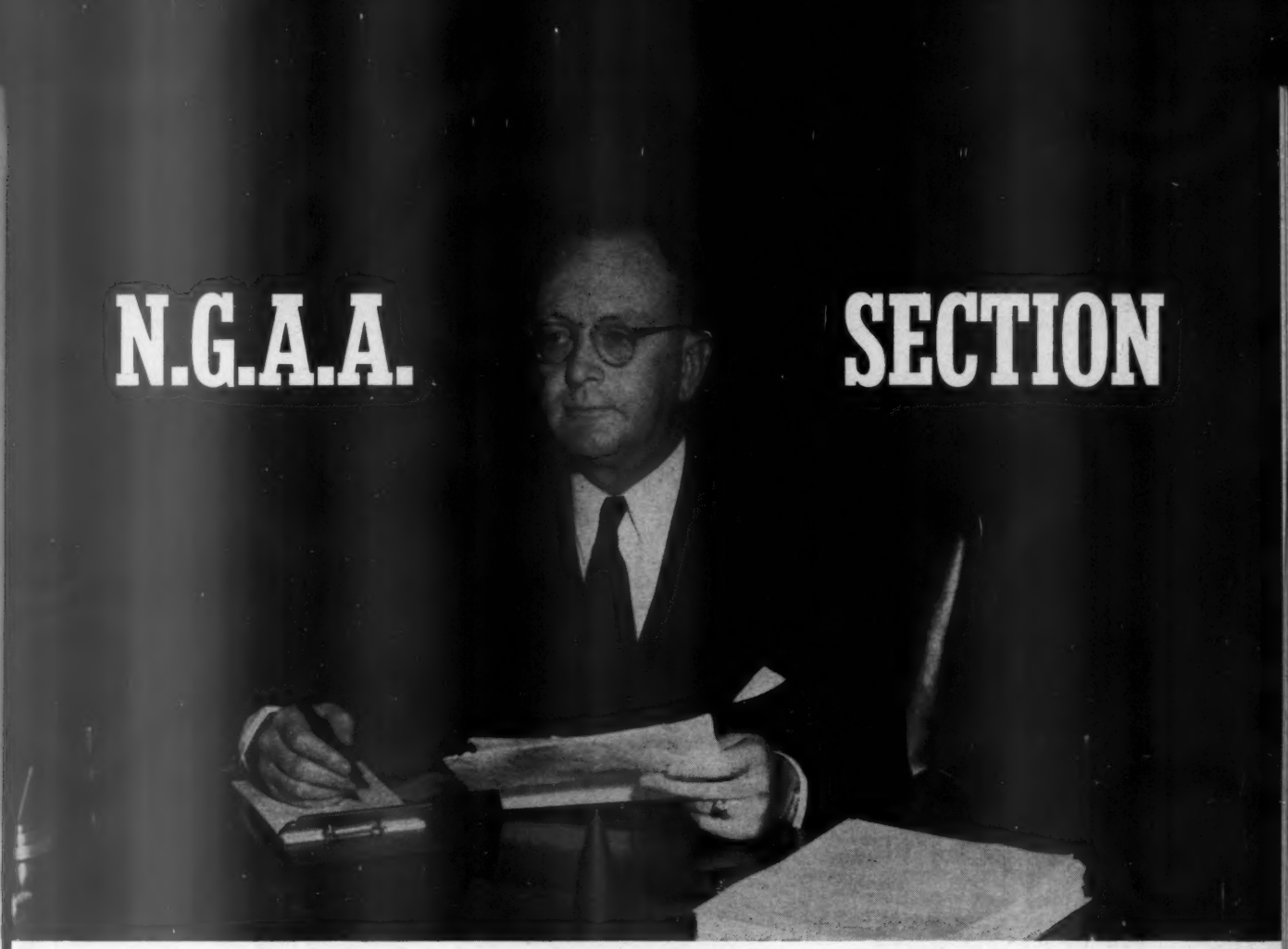


The president of the association composing notes for his annual address

Intelligent Utilization of Natural Resources

by Ray E. Miller*

This N.G.A.A. Section, covering the next 28 editorial pages, contains several of the outstanding technical papers presented at the association's twenty-second annual meeting this week in Dallas, Tex. The section also contains The Journal's annual survey of natural-gasoline and condensate-recovery plants, giving locations and capacities.

WE in the natural gasoline, L.P.G. and gas-cycling industry, are trying to keep our nose in our own business. We welcome collaboration with the production and refining branches of the petroleum industry; we think they are as capably managed as our own operations, but we get awfully fed up with those who, through ignorance or malice, attempt to curtail our operations merely for the sake of promoting another branch of the petroleum industry. Remember also that when I mention natural gasoline I intend to include L.P.G. or cycling products whenever their inclusion is justifiable.

Let us visualize the petroleum industry as made up on the one hand of oil and gas wells with attendant natural gasoline and cycling plants making available to the world markets a wide range of hydrocarbon mixtures from natural gas to heavy tars. As new fields are opened up, or as conservation equipment is developed, the relative percentages of individual hydrocarbons made available to this market changes from time to time.

Then, on the other extreme of our industry, is the market demand which also changes from time to time in the relative percentage of hydrocarbons which it has been educated or developed to absorb.

In between these extremes lies the opportunity of the research chemists and technologists—the refining and conversion operators, to find methods and operate conversion equipment which will take all of the raw products available and process them into fractions demanded by the developed market. This is true conservation and is possible either under a free economy or the national economy under which we are now operating, regardless of the terms you may use to describe it.

Under a free economy, competition between and price adjustments of, the various products guarantee their utilization. Under our present partially controlled economy, intelligent directives and recommendations, plus common sense in the aggregate of petroleum operations could guarantee the same end.

We see now, as we have seen many times in the past, a petroleum in-

*Vice president, Hanlon-Buchanan, Inc.; president, Natural Gasoline Association of America.

Authors of technical papers at this week's N.G.A.A. meeting in Dallas are E. O. Bennett, chief petroleum engineer, Continental Oil Co. (see p. 68); R. C. Alden, director of research, Phillips Petroleum Co.; D. A. Sillers, Lone Star Gas Co.; H. H. Beeson, vice president, Sabine Valley Gasoline Co., Inc., and P. M. Raigorodsky, assistant director, PAW Division of Natural Gas and Natural Gasoline

dustry with too much of some fractions and too little of others and recurringly as those conditions have existed, false prophets have advocated destruction of the surplus fractions. Unfortunately for us in the natural-gasoline and allied branches, we have too often seen that "Sword of Damocles" suspended above our heads. We have protested, but our voices were weak compared to the stentorian tones of such advocates. But, if conservation of petroleum has any merit whatever, why don't we hear more about utilization of what we have? Why shouldn't conversion equipment be used to keep our available petroleum fractions in balance with market demands, rather than adding to the unbalance.

Someone has suggested that our future lies in a research program designed to convert our light ends into crude and heavy fuel oil—then by adding a little sulfur and other contamination, we would give joy to the refiner who could then reconvert them to approximately their original state. Please understand me—I do not indict the whole refining industry but only those **highly vocal,** misguided or malicious members who object to our existence.

Why do we have a natural-gasoline branch of the petroleum industry? If all gas and light ends from an oil well would remain in solution with the oil until it is processed in the refinery, and if the condensable fractions in natural gas were desirable fractions in gas fuel, all would be well. But casinghead gas and volatile fractions were for many years wasted at well mouth, separator or field storage tank and gas utilities found it necessary to dry out natural gas to facilitate pipe-line transportation. This early wastage, constituting the equivalent of 5 to 10 per cent of total oil production, challenged some ingenious conservationists some 35 years ago and our industry was born. No matter whether an individual plant is operated by the oil or gas producer or if such producers decided to deal with separate gasoline plant owners large or small, the sum total of such plants make up the natural-gasoline industry and we who operate the plants are doing a commendable conservation job. I'm proud of our industry.

For many years we have heard the cry of the conservationists that our stripper wells must be preserved in order to save and produce their underground reserves. I say to you that it is just as important to our petroleum economy that all hydrocarbons, once lifted aboveground, be equally preserved.

Wisdom of Opponents Questioned

I wonder if the advocates of natural-gasoline curtailment realize that they are recommending tremendous physical waste of light hydrocarbons? Gasoline plant operators have no control whatever over crude allowables and such allowables combined with their regulated gas-oil ratios, determine the volume of gas delivered under contract by the producer of the plant. The plant operator has no choice but to process whatever gas is thus made available or to waste it after paying the producer's royalty. I know full well that many exceptions can be taken from that statement but, regardless of such quibbling, it is still true as a general statement.

We are hearing a lot about the necessity of additional wildcatting to discover new oil reserves for future demand while at the same time, and perhaps from some of the same voices, we hear recommendations that natural-gasoline and cycling-plant operations should be curtailed or shut down. When will our economic planners wake up to the fact that our conservation program is the equivalent of a lot of new wells and our production does, or can be converted to, replace or postpone those new wells?

Would anyone have the temerity to suggest that from every barrel of oil produced, the well owner must discard some 2 or 3 gal. after production—or that in every proven field every fifteenth or twentieth well must turn its allowable into the ocean? I proclaim that the man is short-sighted or criminally selfish who recommends any curtailment of our operations once the wells have been drilled that produce our raw feed. Again I say we are engaged in and should be commended for salvaging additional hydrocarbons which the well owners would otherwise waste. Our liquid products are useful, whether they be natural gasoline as a raw product, or specialties comprised of any closely fractionated cuts from that raw stream. They are useful in the war-product needs of the present and will again be useful in the peacetime products of the future.

For the past few years, the discoveries of new fields have been preponderately of the light crude and distillate type. Tremendous reserves have been proven and are now available for the drilling, yet the cry is going up to high heaven that we must have more wildcatting, more reserves of heavy crude production. Why? So that old-fashioned refiners can crack it into light products? May I say to the process engineer and to the refiner—why not design and operate your equipment to process readily available raw materials rather than demand as some of you seem to do, that raw materials be discovered and made available to fit your prejudices? The parade is not standing still!

If the present trend of discovering lighter crudes as the drill goes deeper into the earth continues, refining processes must be adjusted to such raw stocks or new refineries will dominate your industry. Can you afford to be stubborn and wait for a

reversal of the oil discovery trend?

A number of papers and discussions on this program cover the conversion of our normal plant products to special products. I can neither recommend nor discourage the additional investment and effort necessary to such ventures. In the late fifties and early sixties the snake-oil market was flooded and new uses were found for crude oil. Early in this century, gasoline was discarded to furnish "oil for the lamps of China" until automobiles were built to consume it. In our own experience, a number of companies or operators who started primarily as natural-gasoline and distillate producers, but who were dissatisfied with the returns of the natural-gasoline market, ventured into the motor fuel, chemical and by-product fields. Such decisions must continue to be made by the individual operator. War dislocations and material shortages may make such decisions impossible now, but tentative plans can be made now for post-war consideration.

The Natural Gasoline Association should continue to sponsor and encourage research disclosing new uses, new processes and new products and make such information available to its members and the industry for their forward planning. Some of us may further engage ourselves in the field of chemicals; some in specialty cuts by close fractionation; some in conversion processes to compete in presently established large markets and some of us, I am quite sure, will continue to make natural gasoline. Many of our plants are small and are comparable to stripper well oil producers, or to water-flooding, repressuring or other secondary-recovery producers. We are not only conserving natural resources, but conserving and liquidating a diminishing investment and no new capital expenditures are justified. We are salvaging what we can of a former investment.

As an industry, we have been repeatedly criticized for keeping our collective noses in our own business, especially when the market was dull.

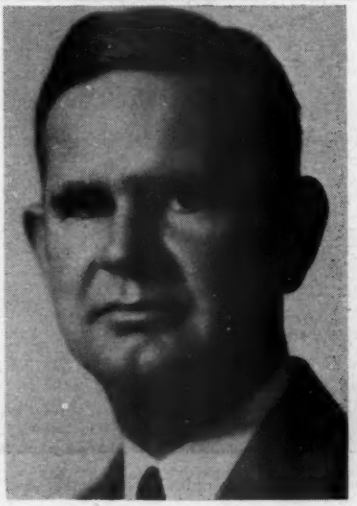
No one has suggested that every oil producer should cease selling crude oil and get into the manufacturing end of the business. I doubt if there is room for Ellick Botts, the Consulting Pumper of Grayhorse, Okla., and all the other stripper-well operators to build refineries individually or collectively in an attempt to escape the danger of 10-cent oil of 1933. Incidentally, I seem to remember motor fuel prices and demand reaching a point where the refiner paid part of the freight to the consumer and charged nothing for the gasoline, to get material out of storage. I also have seen large quantities of butane and propane burned at plants after it was produced and could find no market at any price. Adjoining pastures always look greener, but indigestion seems a common ailment in all walks of life.

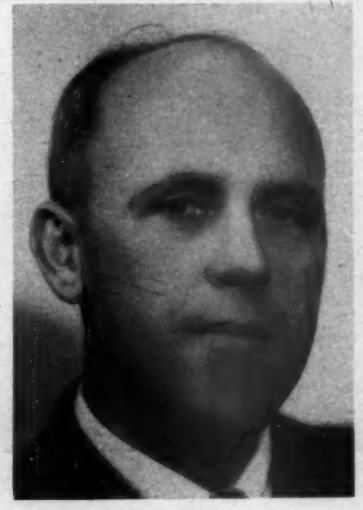
More over, since the great majority of our products are going directly into war products or furnishing fuel for plants making war equipment, we are entitled to our share of available critical materials for repair and maintenance. A place must be reserved in the total supply picture for our total production. Conversion equipment must fit those products into the total demand for petroleum.

We require pressure equipment, tank cars and tank trucks for storing and transporting where pipe lines are not available to us, and such mobile-transportation equipment is not interchangeable with that used for less volatile products. We are earnestly trying to transport our products by using the smallest number of trucks and tank cars necessary to reach the closest market where the best possible war use can be made of them. We have resisted suggestions that we ship to the East Coast for presumably inferior use when such shipments would greatly diminish production of aviation gasoline on the Gulf Coast and at the same time require two or three times the number of tank cars for the longer haul.

In addition to direct conservation, our plants are delaying abandonment of many stripper wells and fields where the residue gas we return for fuel or even the small added revenue from gasoline sales means the difference between continued operation or abandonment.

D. E. Buchanan (above), director in charge of PAW District 3, Houston, Tex., will be the interlocutor at the N.G.A.A.'s "information please" session, a feature of the annual meeting this week in Dallas, Tex. The three men below will assist in directing the session. They are: C. R. Williams, the Chicago Corp.; J. W. Vaiden, Skelly Oil Co., and H. A. Ellis, Cities Service Oil Co.





TEPETATE—Six Years Later

*by E. O. Bennett and F. B. Haverfield**

THE first discussion of Continental Oil Co.'s Tepetate, Louisiana, high-pressure, field-stabilization, gasoline and pressure-maintenance-plant operation was given before the Natural Gasoline Association of America at its annual meeting in May 1937. Since this operation was the first of its kind in the petroleum and natural-gasoline industry, it is believed that a review of its performance during the past 6 years will be of interest to those contemplating such operations and to the industry generally.

The Tepetate field is unique among oil fields, as all phases of operation are concentrated at a central location in the pool. Oil and gas production from high-pressure wells is carried through single lines to high-pressure separators for each lease, which are located in a battery in the central plant. Gas from the separators is metered and passed through high-pressure absorbers for the removal of the condensible liquid hydrocarbons. Gas from the absorbers is compressed and returned to the producing formation. Natural gasoline recovered from the gas, along with propane, isobutane, and normal butane, is delivered by pipe line to the company's refinery at Lake Charles, La., where it is used in the manufacture of aviation alkylate, a product used in making 100-octane aviation gasoline.

Oil from the primary separators is metered and commingled in a common stream after which it passes through a crude-oil stabilizer. In the stabilizer, the crude is denuded of the light fractions that normally would be lost in storage. The light fractions from the stabilizer are recovered as liquids in the natural-gasoline recovery section of the plant. Oil from the plant stabilizer is run to the pipe-line station in the central plant and is pumped to the company's Lake Charles refinery where part of it is processed. The remainder is shipped either by rail or by tanker from the loading terminal adjacent to the Lake Charles terminal and refinery.

The centralization of the field operations has eliminated a low-pressure field gathering system and lease tanks and has greatly reduced the labor required for conducting all field operations.

Effect of Pressure Maintenance

The Tepetate field has been producing for over 7 years, and pressure-maintenance operations have been conducted for over 6 years of this time. The oil recovery to date is greater than the estimated ultimate recovery would have been had the field been produced in the conventional manner. The estimated recovery from this pool by ordinary means of production was 11,000,000 bbl. Production to date is nearly 12,000,000 bbl. All oil subsequently recovered to the economic depletion of the pool will be obtained on account of the continuous return of gas to the producing formation. The ultimate recovery, under the plan instituted, is expected to be as much as 150 to 175 per cent of the ultimate that would have been produced by normal recovery methods. The pool is currently producing at the rate of 2,750 bbl. per day. This rate is determined by and limited to the number of barrels it can produce consistent with good production practice rather than an amount required for market demand. Producing rates should always be governed in this manner except where production demands of strategic crude on account of war emergency may exist.

Effect of Gas Returned

During the past 6 years over 32 billion cubic feet of gas have been compressed and returned to the producing formation. Under existing subsurface temperature and pressure conditions, this gas occupies reservoir pore space equivalent to that of 43,500,000 bbl. of liquid, and its return to the producing formation has been responsible in greatly retarding the rate of pressure decline and water encroachment.

The line on Fig. 1 shows the relationship between cumulative production and pressure decline. The effect

*Continental Oil Co., Ponca City, Okla.

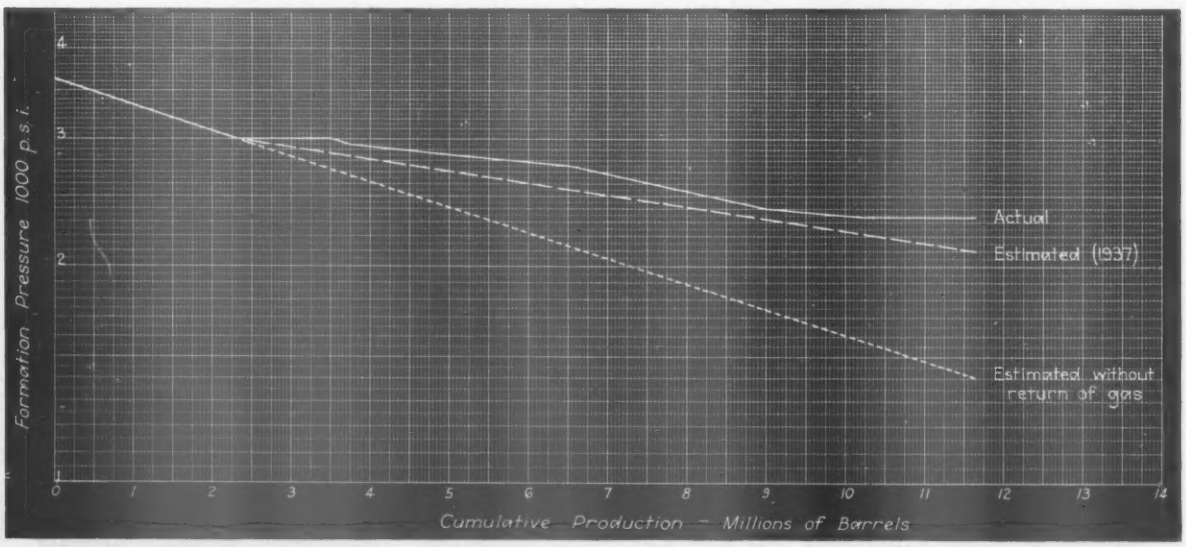


Fig. 1—Relationship between cumulative production and pressure decline

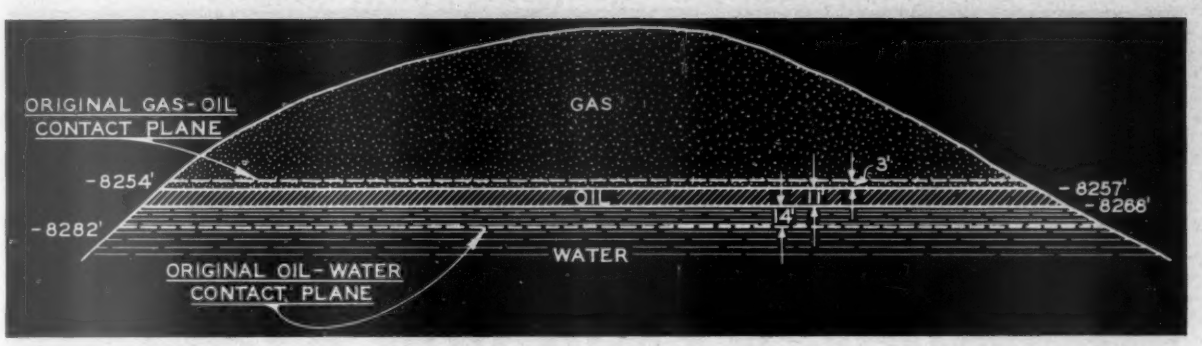


Fig. 2—Gas-oil and water-oil contact planes under original reservoir conditions at Tepetate

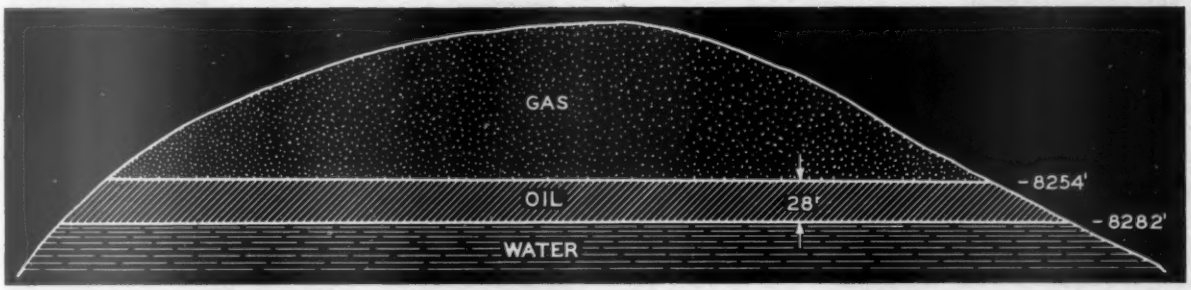


Fig. 3—Relative positions of gas-oil and water-oil contact planes after 7 years of operation

of the gas returned is reflected in the change of slope of the pressure-decline line. If the above volume of gas had not been returned, it is estimated that the present formation pressure of 2,345 lb. per sq. in. would have been reduced to 1,400 lb. per sq. in., as shown by the extension of the pressure-decline curve slope established before any gas was returned; thus a saving of 945 lb. per sq. in. of formation pressure has been made. The energy stored in the reservoir by this gas-conservation program is sufficient to flow all the recoverable oil the pool will ever produce. The saving of pumping equipment otherwise required and the reduced lifting cost for the oil produced up to the present time have been more than sufficient to pay for the entire installation of all necessary equipment for compressing and returning gas to the producing formation.

The 32 billion cubic feet of gas returned to the producing formation at Tepetate contains 41,600,000,000,000 B.t.u. of heat energy, which is equivalent to the heat energy in 1,500,000 tons of average dry bituminous coal.

From a fuel angle, gas saved in a closed reservoir is considered the same as known deposits of coal in a mine. Gas for fuel, however, may be produced with less effort and expense than a heat value equivalent from a coal mine and in a much shorter time.

Effect of Gas Return on Gasoline Content of Produced Gas

Fig. 2 shows a cross-sectional view of the Tepetate field under original reservoir conditions. It will be noted that the gas-oil contact plane is 8,254 ft. and the water-oil contact is 8,282 ft. Both measurements are subsea levels and were obtained from a careful analysis of electric logs taken in each well as it was drilled. These data show the original sand section saturated with oil to be approximately 28 ft. thick.

Fig. 3 shows the relative positions of the gas-oil and water-oil contact planes after 7 years of continuous operation. The original gas-oil contact plane has been lowered 3 ft. and the water-oil plane raised 14 ft., leaving approximately 11 ft. of saturated section. It was planned to have the gas-contact and water-contact planes approach the center of the section at the same rate, but the sale of some gas prevented the gas cap expansion originally anticipated.

Wells were originally completed in the approximate center of the 28-ft. saturated section with only 30 in. of perforations in the casing. As the rising water table approached the bottom of these perforations and the wells began to produce water, they were plugged back and reperforated slightly higher. The plugging back and reperforating in only a few feet of sand 8,300 ft. below the surface is a very difficult job; however, good results have been accomplished. To date the water encroachment has necessitated the reworking of 33 wells and the abandonment of 4 edge wells.

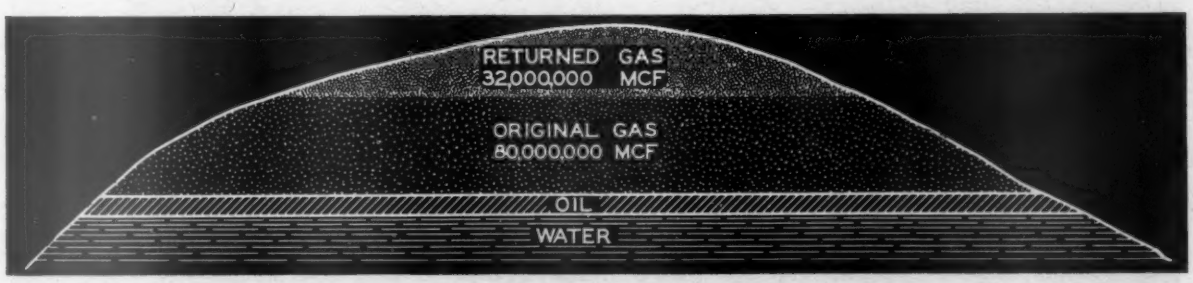
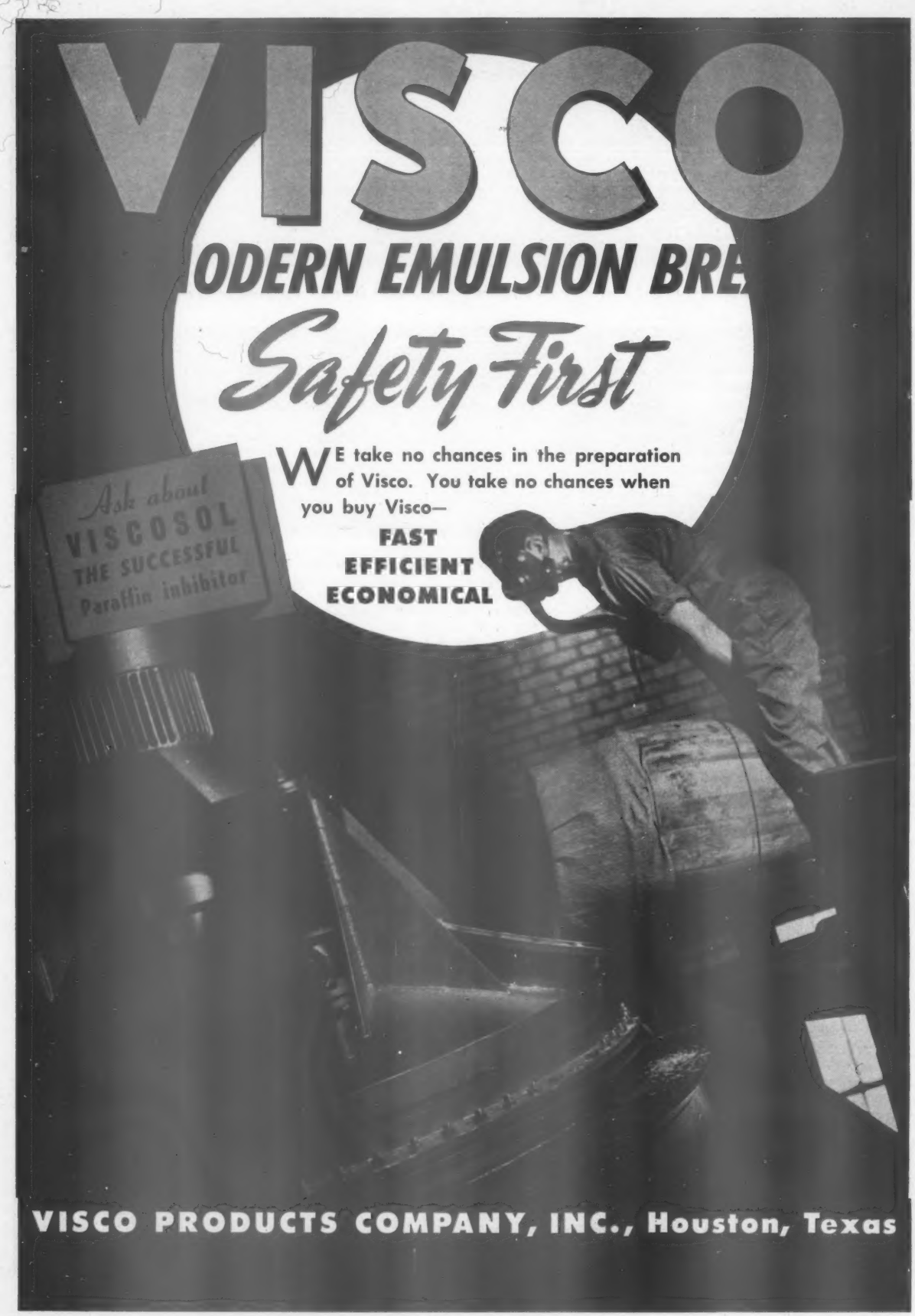


Fig. 4—Showing amount of gas returned in the densely shaded section and the present location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With the lowering gas-oil contact plane, as shown by Fig. 3, it can be seen that, as the field becomes older, gas-oil ratios will continue to increase because of gas coning at producing wells on account of differential pressure and an ever-thinning liquid seal over the casing perforations. Production rates must be controlled at all times to maintain a liquid seal over the casing perforations. The shorter the length of casing perforations the more readily such control may be effected. The past 6 years' performance of the pool has proved the advisability of completing wells as described above.

It would first appear that an increase in gas-oil ratio would decrease the percentage of recoverable liquid hydrocarbons from the produced gas. This, however, has not happened, and a comparison of analyses for liquid hydrocarbon recovery made at the start of operations and at this time shows that there has been practically no change. The first analysis was made in 1936, the last one this year.

No Gas Bypassing

Fig. 4 shows a cross-sectional view of the Tepetate field. It also shows the amount of gas returned in the densely shaded section and the present location of such gas. The gas in the structure above the oil level was in equilibrium with the oil in the saturated section prior to any development; and since the dry residue gas was returned to the crest of the structure, there has been no bypassing of dry gas into wells producing oil. The gas produced with the oil is either solution gas or free gas in equilibrium with the oil from the gas cap adjacent to the wells. Its quality remains practically constant and will continue to do so until enough gas has been produced with the oil and sufficient dry gas returned to displace the entire original volume of gas in the gas cap. Experience indicates that dry gas returned to the top of the structure does not readily mix with the wet gas in the cap but displaces the wet gas ahead of it as additional volumes are injected. Due to the existence of the above action, it can be seen that the performance of the gasoline plant will remain practically constant over a period of many more years. It is further indicated that when the gas cap becomes completely filled with dry residue gas, such residue may be forced into and through the oil zone before being produced and that it will become partially saturated with condensible hydrocarbons and further extend the operating plant life and add to the total liquid-hydrocarbon recovery. A gasoline plant operating in connection with this type of field practice is more assured of a financial payout without many of the hazards normally encountered. When this process has reached its economic limit, the volume of gas saved up to that time will be available for market use, for reforming to synthetics, or for use as fuel.

Gas returned since the start of gasoline recovery operations has maintained the pressure high enough to assure continued uniform operation of the high-pressure absorber plant and present indications are that this plant may be kept operating by well pressure to the economic limitations of oil and liquid hydrocarbon recovery. This fact is emphasized as there has been considerable discussion concerning the advisability of high-pressure operations on account of possible plant obsolescence due to well pressure depletion before proper recovery was made. It can now be definitely stated that, in connection with pressure-maintenance systems properly operated, high-pressure absorption processes are cheapest and most economical and may be operated with no more difficulty than any of the generally known low-pressure processes. Since the Tepetate plant was placed in operation, many absorption plants operating at much higher pressures have proved the efficiency and wisdom of development in this direction. Plants with operating pressure approaching 2,000 lb. per sq. in. are now giving excellent recoveries in absorbing light hydrocarbons that were formerly inefficiently recovered by retrograde condensation. It now appears that, by recirculating the heavy molecular cut out of a liquid recovered from gas by retrograde condensation as an absorbent media, operation pressures far in excess of 2,000 lb. per sq. in. may be used. And certain recovery operations heretofore considered impractical will become commercially attractive.

One of the numerous benefits of a gasoline plant operation in connection with a properly controlled field stabilization and pressure-maintenance system is the uniform rate of production which may be maintained. In the Tepetate field the plant throughput has been very constant day after day, and load peaks have been eliminated. Any plant operator will appreciate the value of such a condition existing over a period of years, both from an operating and a producing angle. While this plant and pool are owned by one operator, the same type of operation is being obtained by cooperative arrangements in areas of divided ownership.

Liquid Meters

In order to operate a field stabilization plant in connection with natural-gasoline-recovery operations, it is necessary that all liquids produced from the wells be measured under pressure until such well liquids have been stabilized to pipe-line conditions.

The only practical manner that this operation has developed by which liquids can be accurately measured under pressure is with positive displacement meters. Such meters are either of the rotating or reciprocating piston type.

Many millions of barrels of oil have been measured by meters in the Tepetate field, and no particular difficulties have been encountered. Normal wear and tear on meters due to amorphous sediment in crude oil must be expected, and periodic inspection and adjustments must be made to keep meters in proper working order.

(Continued on Page 75)

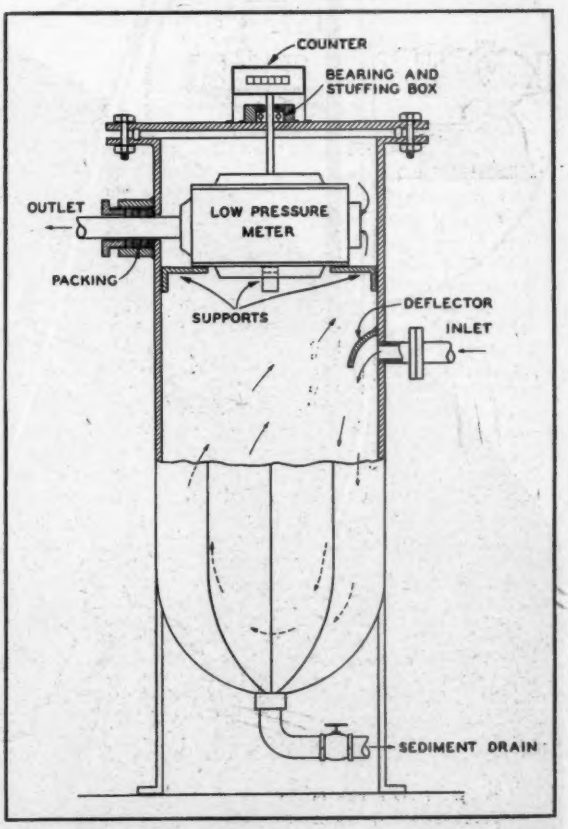
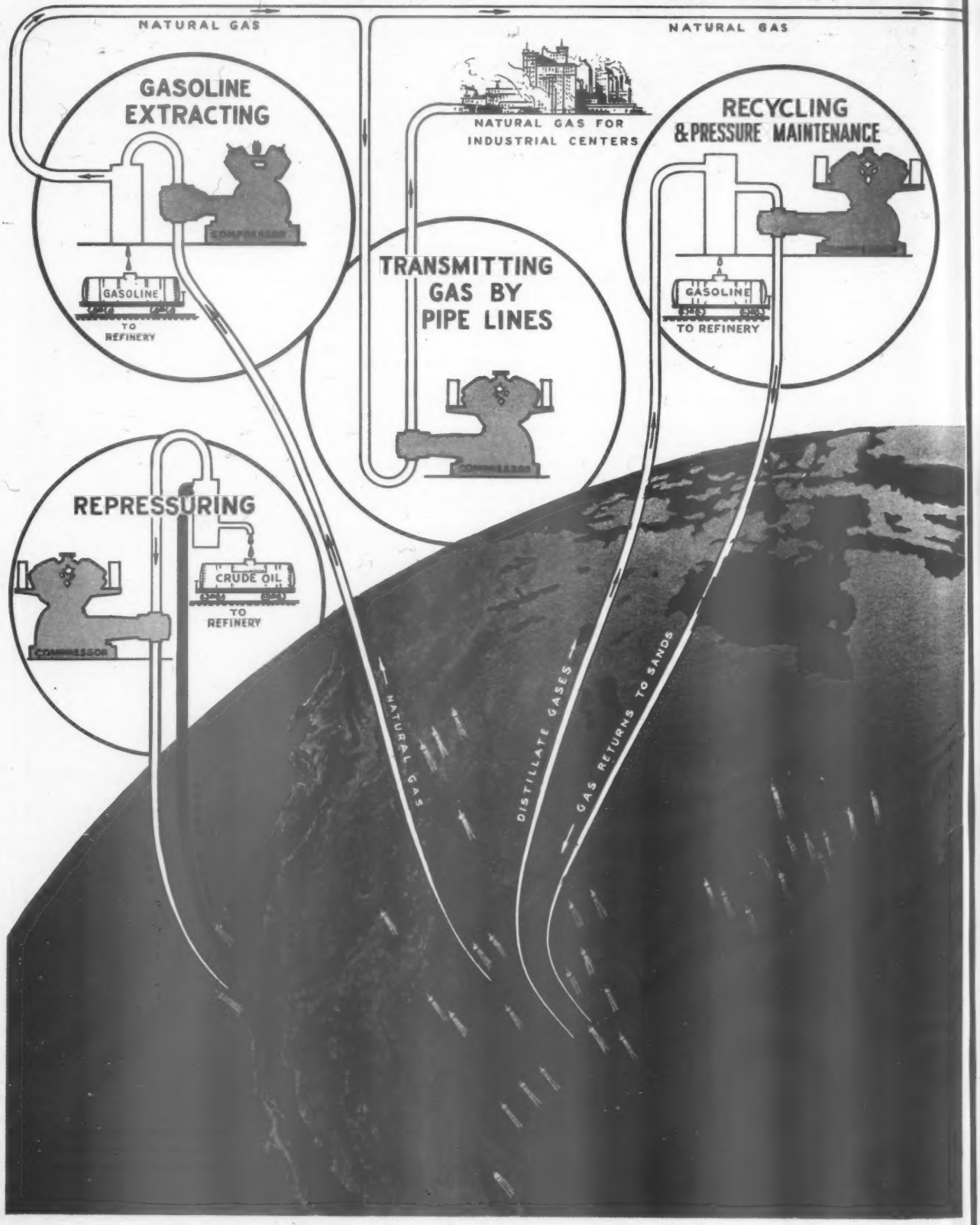


Fig. 5—An arrangement at Tepetate whereby a 25 or 50-lb. working-pressure meter may be used for operation on any pressure up to several thousand pounds per square inch

NOW... *More than ever*



Experience has shown that filters having suitable permeabilities for the stopping of sediments that cause wear will became plugged after very short operating periods and that their use cannot be justified.

High-Pressure Meters

Meters for use in measuring high-pressure liquids are expensive because of the design and materials required to withstand the differential between the line pressure and atmosphere. Fig. 5 shows an arrangement in general use at Tepetate whereby a 25 or 50-lb. working pressure meter may be used for operation on any pressure up to several thousand pounds per square inch. The method consists of installing the meter in a secondary case with its intake connection open to the inside of the case. The discharge connection of the meter is carried out of the secondary case through a suitable stuffing box as shown. Pressures of any magnitude may be packed off in such a stuffing box. As shown in the sketch for the meter setting, the outer casing may be made with a settling trap at the bottom for the accumulation of sand and other large particles. This settling trap has been found advantageous in eliminating wear and tear on the meters. The counter drive shaft is taken through the outer shell through a small Timken bearing and stuffing box and has operated in a satisfactory manner. Magnetic drives through a nonmagnetic diaphragm are now being developed and will eliminate the necessity of the stuffing box and bearing. Where many positive displacement meters are used in a battery, it has been found advisable to install an overhead craneway to aid in removing any particular meter for inspection, calibration, and repair. At Tepetate the craneway extends over the meters and into the meter repair shop at the end of the installation row.

Outside Installment of Equipment

Six years of operating experience has definitely indicated that outside installation of motor-driven pumps and boilers is feasible and practical and minimizes initial plant installation and depreciation costs by the elimination of buildings. This type of installation, however, is not recommended for regions where temperatures far below freezing exist during winter months.

Elevated engine room floors with all high-pressure lines brought outside under such floor levels but above outside grade lines with all headers exposed have proved advantageous from a maintenance and inspection standpoint. This general arrangement has been almost universally adopted by the industry in the design of plants in connection with high-pressure gasoline and condensate-recovery plant operations.

The only failures of welded connections that have been observed have been a few hairline cracks immediately adjacent to welds in lines tying into compressor cylinders. It is believed that these have been due to the use of too heavy beads in the initial welding and that a multiplicity of lighter beads on thick-walled pipe will eliminate such occurrences. In no case has any leak of consequence developed, and those appearing have been satisfactorily repaired by welding.

Alloy grade drill pipe was used for certain high-pressure field lines when suitable medium carbon steel was not available. Difficulty was experienced in welding such lines, as such pipe was originally designed for screwed connections; and no suitable welding rod material was available. Since there is a shortage of critical materials due to the war, operators may be forced to the use of alloy grade pipe on hand; and they should take extreme precautions when fabricating such pipe by welding.

High-Pressure Check Valves

The initially designed nonreturn valves for high-pressure gas lines at Tepetate were equipped with ball and cage checks, as no suitable check valves were available at the time of plant installation. Pulsations caused by compressor surges of dense gas caused the balls to oscillate and pound against their cages and seats, causing undue wear. Wafer-type valves similar to those used in compressors have been substituted and this trouble eliminated. The use of wafer-type, nonreturn valves is recommended for all high-pressure gas lines receiving their supply from compressor cylinders.

Desalting of Crude

One of the first large desalting plants was installed at Tepetate for the removal of salt from the hydrocarbon liquids produced. Well-head liquids carry salt content as high as 2,465 g. per barrel. This liquid is treated with an average of 0.00183 gal. of chemical per barrel and then run through electrostatic precipitators where the salt content is reduced to approximately 1.3 g. per barrel. Several years' operation of this type of desalting equipment has definitely proved its worth in plant operation and has eliminated many thousands of dollars of wear and tear on refinery heat-exchange equipment. During the operation of desalting, dehydration is also accomplished, and no further treatment of the well production for water removal is required.

Frangible type rupture disks in lieu of safety valves have proved efficient and satisfactory. Experience has indicated that the discharge lines below safety disks should never be manifolded together to a vent, as a pressure surge on the down stream side of the disks will cause them all to rupture when any of the disks fail.

The header holddown clamps used in this plant consist of a "U" shaped stirrup over the header. The ends of the stirrup are welded onto a plate set in the concrete supporting block. Three set screws pass through the stirrup in radial alignment toward the center of the header pipe. These set screws are backed away from the header until operating temperatures are reached and are then tightened down just enough to stop vibration. A sole plate is used at the end of the set screw to prevent it from abrading the pipe. This arrangement permits motion due to temperature change and has been entirely satisfactory. Its use has been generally adopted in most high-pressure operations.

Plant Ventilation

Forced-draft ventilation in engine and compressor rooms has proved advantageous, and its use is recommended for all high-pressure plant operations.

Motor-driven uptake fans located at the ridge of the plant building have been found to give best results. With such units, engine and compressor rooms have been kept to workable temperatures and explosion hazards minimized. Complete explosionproof electrical equipment should always be used.

In concluding we note the closing paragraph of an article on stabilization by F. L. Kallam.[1]

"It is the writer's concluding opinion that crude-oil stabilization can be adapted to many of our domestic fields in sizes commensurate with the local conditions. Fundamentally, no issue can be taken with a process which cures evaporation loss at the source and makes unnecessary the subsequent recovery of such losses in order to prevent economic waste. In all new fields, and in many of the existing fields, the system of crude-oil stabilization should be carefully considered in view of its possibilities for greater efficiency and economy in conserving our petroleum resources."

It should be emphasized that the successful operation of an integrated plant such as the one at Tepetate which involves three operating divisions of the company, namely, the production, natural gasoline and gas, and pipe-line divisions, requires the full cooperation of each and close coordination between all. This has been accomplished with gratifying results under the direct supervision of the natural-gasoline and gas division.

In acknowledgment for many of the innovations which made the construction and operation of such an integrated plant feasible, credit must be given to the field men of all divisions.

1. "Stabilization of Crude Oil," by F. L. Kallam, March 1943, Petroleum Refiner, Vol. 22, No. 3.

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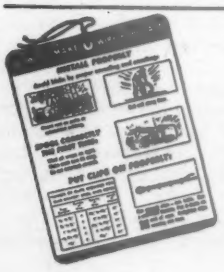

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Facts About and Possibilities of Akylation And Isomerization Processes

by Arch L. Foster

ALKYLATION and isomerization are relatively new reactions which have been developed to commercial applications in recent years. The rapid advance is due in great part to the critical demands on the petroleum-refining industry for war products of more highly specialized properties in amounts hitherto undreamed of during the less-frenzied peacetime preceding the present war.

Alkylation may be defined as the reaction by which isoparaffins, aromatics and similar hydrocarbon molecules are combined by addition with olefins and unsaturated hydrocarbons to produce larger and more complex molecular structures with certain enhanced properties. The improvement of these properties is not necessarily an unavoidable change resulting from this reaction, but so far as aviation and motor fuels are concerned it is that change which is the primary reason for carrying out these reactions commercially on a large scale.

Structural Rearrangement

Isomerization is that reaction whereby a structural rearrangement of the atoms in a hydrocarbon molecule is effected without changing molecular weight. This rearrangement produces changes in physical and chemical properties of the original molecules and again it is to accomplish these changes that the isomerization reaction has been commercialized, and will doubtless continue to be employed on an ever-increasing scale. In isomerization operations other secondary molecular changes take place. Molecular size is changed by forming molecules of higher and lower molecular weight. These changes are not essentially isomerization effects, but occur as a result of side reactions of addition or alkylation, decomposition and molecular rupture, secondary reactions which cannot always be eliminated satisfactorily.

To summarize the several processes which are being and will be used to make petroleum fuel products, they are thermal cracking, catalytic cracking, polymerization, dehydrogenation, hydrogenation, alkylation, isomerization, and superfractionation. For present purposes polyforming, hydroforming, reversion, isoversion, cycloversion and such recently developed processes may be classed as specific applications or combinations of the above processes, although in a more exhaustive discussion this may not always be strictly true.

From the standpoint of either motor or aviation-engine fuels, these processes represent the tools of the refiner and gasoline manufacturer for making these products demanded by the consumers, present and future. None can say just what the standard specifications for either of these fuels will be at the time when a modicum, at least, of sanity returns to the mad human race. The general outlines of those specifications may even now be written without serious fear of contradiction. These outlines appear to be: Very much greater quantities of aviation fuel of the 100-octane grade and doubtless considerably higher; additional properties required will include those brought to light during the war, concerning extreme-performance conditions, typified by the effects of aromatics and naphthenes on fuel characteristics; a greater degree of chemical cleanness, freedom from gums, sulfur and nonhydrocarbon impurities; at least as great and probably greater quantities of a much more efficient motor fuel for land-bound vehicles.

Assembled Fuels

It is no new idea that the internal-combustion-engine fuels of tomorrow will be "assembled" products. That, in a relatively simple degree, has been the case for many years. The two main differences will be more exacting, higher specifications for individual components with much less of low-grade "diluents" which do not add to, and frequently detract from, the qualities of the complex finished fuel.

With products from thermal cracking we are familiar, as an industry. We cannot see the elimination of that process from the "stable" of processes in refineries, rather a relegation to a less-conspicuous, less-important position in the field. Thermal methods have not produced, so far, products suitable for aviation fuels because of the unsaturation of the major components. Thermal methods in the future will produce a portion of motor and aviation-fuel components and will supply unsaturates, olefins, etc., for any number of raw-material requirements, charge stocks for other processes, for chemical syntheses, etc.

The one most important Aladdin's Lamp for the refiner is the catalyst. More than a generation ago Ipatieff, Sabatier, Senderens and other pioneers started building the science and technology of catalysis. Today those catalysts are being applied widely to petroleum-refining processes and the results already are straining both imagination and credulity. Six of the other seven processes listed now are based on catalytic action.

Manufacturing Stages

Catalytic cracking is making the base stocks, containing aromatics, naphthenes, isoparaffins, etc. With octane number in the higher 70's and well into the 80's this stock is indispensable to our present aviation fuels. Hydrogenation, dehydrogenation and polymerization are methods for increasing the reactivity of hydrocarbons, for eliminating unsaturation which brings a train of problems in aircraft fuels, and for the combination of smaller unsaturated molecules into larger and more usable ones. Oxide catalysts of metals such as aluminum, iron, chromium, nickel, copper, manganese, vanadium and others are used successfully to remove hydrogen from hydrocarbons at elevated temperatures up to 1,200° to 1,400° F.; other metal oxides accomplish the reverse reaction of addition hydrogen to olefins. Polymerization by catalysts such as phosphoric, sulfuric and metal salts has been in use for a decade on a large commercial scale. Polymerization by heat-pressure methods is old in the art, also.

Alkylation and isomerization are the youngest of this catalyst-fathered family of processes. Three major and several minor catalysts have been developed; the first three are sulfuric acid, anhydrous aluminum chloride plus HCl, and hydrous hydrofluoric acid HF. The first process was that developed by Dunstan and others in England (Anglo-Iranian Oil Co.) and by several companies in this country, more or less simultaneously though independently. Concentrated sulfuric acid, about 95 per cent, is brought into contact with an isoparaffin, usually isobutane, at low temperatures of 40° to 75° F. or thereabouts,

(Continued on Page 81)

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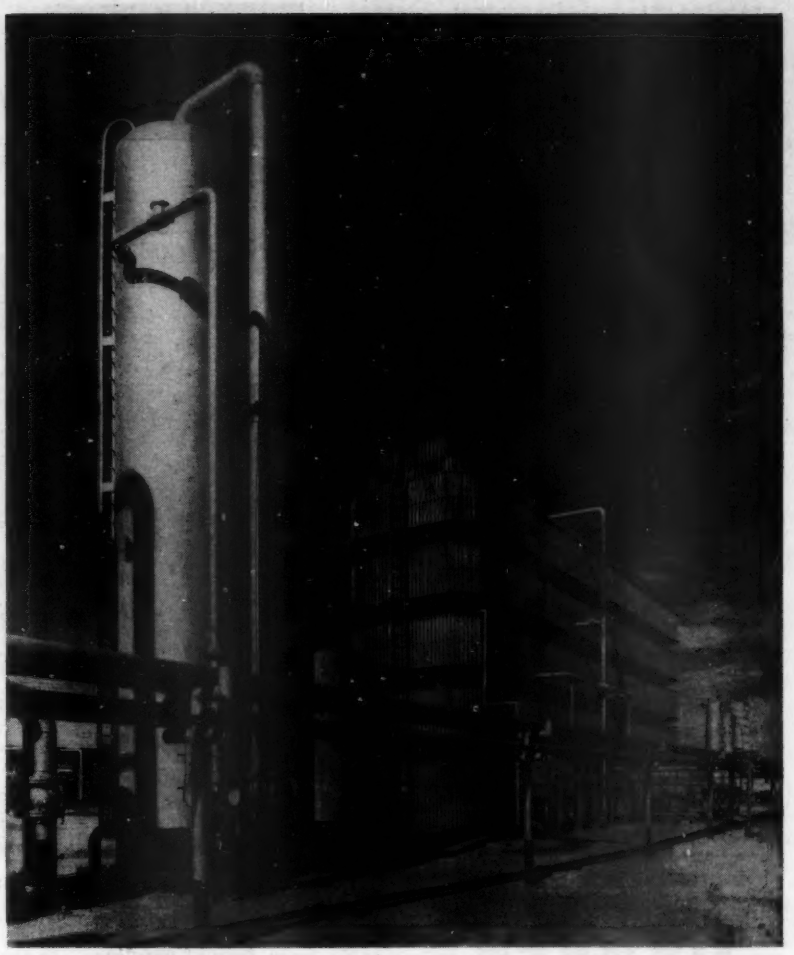
and small percentages of an olefin such as butene (butylene) are introduced while the mixture is agitated vigorously. Low temperatures are used and the isoparaffin-to-olefin ratio is kept high—8:1 to 20:1—to avoid polymerization of the butene to dibutene, an undesired reaction. Yields of 90 to 95 per cent of a product chiefly isooctane and of 90 to 95-octane number are obtained. Octane number of isooctane—2,2,4-trimethylpentane—by definition is 100. The reason this commercial product shows a lower rating is due to the formation of products other than isooctane by side reactions which are minimized but cannot be eliminated economically in practical operation. The process has been in operation several years, large quantities of alkylate have been made and used in commercial fuels, and its requirements, operating conditions and limitations are well understood.

Alkylation by means of aluminum chloride with hydrochloric acid as promoter is relatively new, only a few plants being in operation. Temperatures, while higher than those used in the "cold" H_2SO_4 process, are still low, below 30° F., it is understood.

Properties Essentially Same

There appears to be little essential difference in the properties and blending qualities of alkylate from these three processes. Certain small percentages of impurities, each peculiar to the catalyst employed, may affect antiknock ratings, TEL susceptibility. Strong efforts to eliminate these impurities are made, of course, generally with efficient results. Volatility may vary somewhat in the product as compared to another but in general the results are similar and values are of the same order of magnitude. Some indications known are that octane ratings for HF alkylate may tend to be slightly higher than that from the other catalysts; considerable difference of opinion on this point would be expressed by different technologists if brought into open discussion.

Anhydrous HF, newest of these successful catalysts for alkylation and isomerization, appears to offer some of the most advantageous properties and results. A liquid boiling at 67° F., a low spring temperature, it is easily removed from the reaction mixture. Small residual percentages are removed practically quantitatively by special treatment. The anhydrous acid is relatively noncorrosive to most metals, becoming corrosive only when water enters the system. It is a mild industrial hazard to personnel, but precautionary measures are simple and adequate for all purposes. In fact, it is no greater hazard than are scores of industrial chemicals employed widely in large quantities. Being a vapor at reaction temperatures intimate contact between catalyst and charge in either liquid or vapor phase is simple and effective. The catalyst may be dissolved in one component of the charge to the required concentration, the solution brought to reaction temperature and into contact with the other component by mixing. Strong agitation is productive of the best reaction yields. Very little sludge is formed in either alkylation or isomerization. HF is recovered practically quantitatively from the spent acid, for reuse.

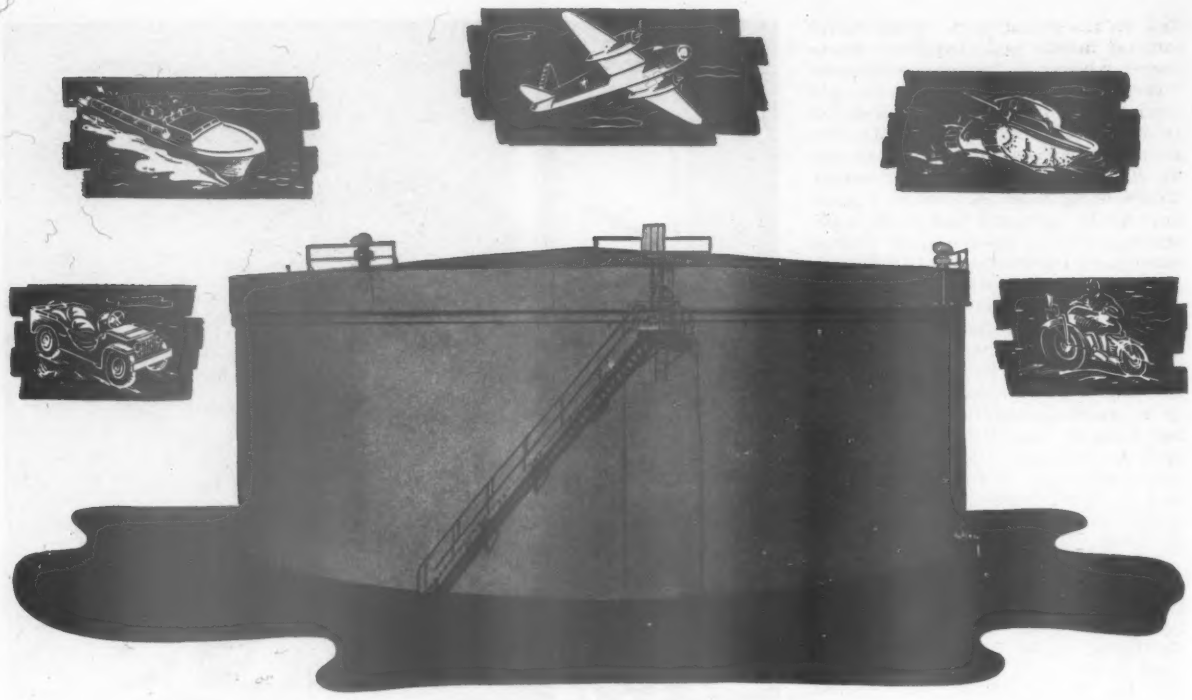


Absorber and cooling tower at one of Warren Petroleum Co.'s natural gasoline plants

The use of HF as an alkylating catalyst has been known for some years. It effects the union of olefins, ketones, alcohols, acid anhydrides, with benzene and aromatic hydrocarbons, by means of which a great number of chemicals may be synthesized. One of its interesting reactions is the formation of normal propyl benzene by alkylating benzene with cyclopropane; alkylation of benzene with propene (propylene) results in a preponderant yield of isopropyl benzene. HF has also been used as a promoter with boron frifluoride for alkylation of aromatics with olefins.

One recommendation for the use of HF as catalyst is the simplicity of the reaction conditions, the low temperature and pressure employed. Benzene may be alkylated with propene at 0° C. (32° F.), in 84 per cent yield without making special effort to find out the best conditions for maximum yield. Information available indicates that yields of more than 90 per cent of theoretical have been obtained with catalyst loss of only a few tenths of 1 per cent, when alkylating isoparaffins with olefins. Its initial cost is higher than that of sulfuric acid or of aluminum chloride, being quoted at 20 cents per pound in large quantities in 1940, as compared to 1.5 and 7 cents for sulfuric acid and anhydrous aluminum chloride, respectively. The high recoverability of HF as compared to the other two catalysts probably results in an actually lower catalyst cost per gallon of product (alkylate).

To indulge in some generalized calculation, to give some idea of the amounts of alkylate which might be produced from the butanes, also from butanes and propanes in natural gasoline or produced during the production of natural gasoline. Production of natural gasoline in 1942 in the



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United States east of the Rockies, according to the best available figures and corrected to 26-lb. vapor pressure credits 1,505,029,000 gal. Accepting average percentage estimates for the butane represented by this production gives nearly 422,000,000 gal. Yield percentages vary widely from different sources and are changed rapidly as operational efficiencies are improved. Employing as a fairly conservative estimate a 57 per cent overall yield on the total butane, when carried through the various steps of isomerization, dehydrogenation, alkylation and fractionation to end point, this amount of natural-gasoline butane should produce 240,000,000 gal. of 90-95-octane alkylate annually, of Reid vapor pressure varying from 3 to 5 lb., depending on the details of fractionation.

Keep in mind that this is possible yield. A large proportion of this butane is produced in smaller plants, not large enough in output to warrant installation of an alkylation unit as we now see it. As time goes on these smaller increments may be collected in one place to give charge stock enough to justify an economically sound investment in such a unit. This amount of alkylate equals 19,000 bbl. per day. Assuming a 30 per cent blend of alkylate with other components this will produce 19,150,000 bbl. of 100-octane number aviation fuel annually or approximately 64,000 bbl. per day.

Empirical Estimates

These estimates are empirical, made merely to show the order of magnitude of the possible output on the basis of available raw material. It is safer to assume that only some smaller percentage of this raw material is available economically, because of the problems faced in collecting at central points the smaller amounts produced in various scattered plants. That this collection can be carried out economically in at least several instances is already demonstrated by more than one system now in operation to collect raw hydrocarbon stocks for this or other purposes. Even if all the raw material reported and used in these calculations were collected and processed, the amount of alkylate produced is a small fraction of the total aviation fuel now required for our armed forces alone, if the rumored size of that demand is at all correct.

As to further calculations of possibilities, conservative estimates (published) show that 555,000,000 gal. of liquefied petroleum gas were marketed last year. Using percentage estimates of the propane and butane content of these fuel gases, obtained from what are considered quite reliable sources as broad averages for the exactness of which the author cannot vouch personally, and using 600,000,000 gal., a probably more rep-

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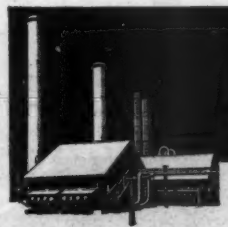

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resentative total figure, these gases contained about 290,000,000 gal. of propane and 310,000,000 gal. of butane. Alkylated on fairly conservative estimates, according to experimental results, these quantities may be expected to produce about 8,000,000 bbl. of isoheptanes, etc., per year. Needless to remark, only a small percentage of this potential production can be considered practicably attainable short of an extended period of development and evolution.

As to costs of operating these processes and of the products, the best that can be done now is to accept the estimates worked out by those in closest contact with the design and operation of these units. These estimates are not available for public disclosure. If we work backward and forward at the same time to determine the margin from which total manufacturing costs and profits can be paid; with a 57 per cent over-all yield and with L.P.G. quoted at 2.5 cents per gal., and natural gasoline (butane) at 3⅞ cents, the cost of charge stock per gallon of product is 4.38 cents from L.P.G. and 6.8 cents from natural-gasoline butane. Doubtless in a peacetime economy this price differentiation between these two sources would vanish and both butane and propane would be recovered and concentrated at a cost based on normal factors; what these factors will be after the war, no one can know.

At the higher—6.8 cents—figure, the margin for paying all costs lies between that and the at-plant product price. If that price is 12 cents, the producer has 5.2 cents from which to pay royalties, amortization, depreciation, operating and all other costs. Therefore, the feasibility of operating one of these units reduces to the ratio of three factors; costs of raw materials and manufacturing against selling price, the simplest equation in economics which must be solved for any projected industrial operation. We wish the practical solution procedure were only half as simple as is the statement of the problem in these simplest terms.

Isomerization a Versatile Reaction

It is our belief that too little attention has been given to the isomerization reaction as a means of preparing final products, as contrasted to the usual consideration given to it as a method for making a raw material for alkylation or other processes. It has been thought of, and used to convert normal hydrocarbons to isomers to supply additional isoparaffin stock for alkylation purposes, and this appears to be its major application at present. The discovery of means to carry out this reaction was a very timely one, prompted and urged along by the shortage of isoparaffins of natural occurrence for use in alkylation. Incidentally, alkylation is a decided advance over the earlier

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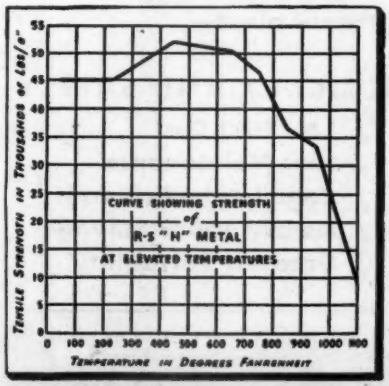

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polymerization of olefins and hydrogenation of the resulting olefin polymer to the same isoparaffins in two major steps now accomplished in one step by alkylation.

Isomerization recently came farther into the limelight by the development of the catalytic neohexane synthesis by Standard Oil Co. (Indiana) technologists. The original commercial-scale synthesis of neohexane was by the Phillips, or Frey, process, by heat and pressure alone, combining ethylene, made by thermal cracking of natural ethane-propane mixtures, with isobutane concentrated from natural gas, the reaction taking place at 4,000 lb. or higher pressures and 900° F. or higher temperatures. This is considered one of the most unique and unusual syntheses in refining technology and until about the first of this year had not been duplicated by catalytic methods. Details of the catalytic synthesis have not been divulged because of war-born secrecy regulations, except that it is referred to as a "development of the Isomate process." This latter process is the blanket isomerization of low octane number refinery or similar naphthas by treatment with the $AlCl_3$-and-HCl catalyst team, by which octane number improvement as high as 40-50 has been claimed in private communications.

Economic Outlet

What is more natural to assume, therefore, than that isomerization of low-grade refinery naphthas, or of low octane number natural-gasoline residues after the higher octane rating materials have been removed for special components of highly specialized products, will offer an economic outlet for these low-grade materials, if fuel development and economics force the industry to improve those materials above their natural characteristics?

Thermal reforming is in a sense an isomerization, albeit not in the strict chemical sense of the word. The average molecular weight of the material is not changed essentially although reformed gasoline usually has higher vapor pressure than the original charge, and a different boiling range. Such a classification of thermal reforming must be taken in a very general sense.

The specification which the natural-gasoline industry has always sold, on which it is built, is volatility. In recent years octane number has been an important second. In the future, we have every reason to believe that these conditions will continue, qualitatively, with added emphasis on octane number. As to volatility, one possibility looms, not definitely at all, which might or could eliminate or reduce seriously the demand for volatile fuels. That possibility is solid injection of fuels instead of vaporization-atomization in the conventional carburetor mechanism. If fuel be

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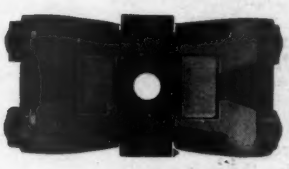

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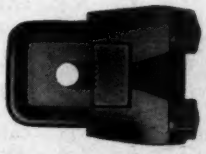
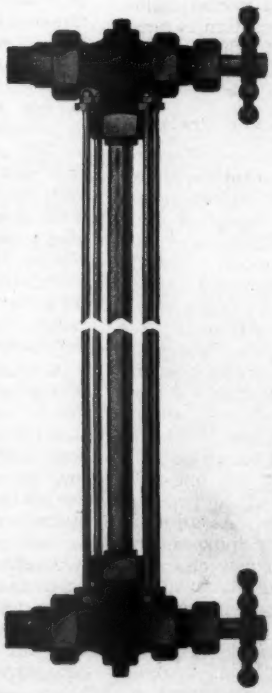


PENBERTHY *Reflex* DROP FORGED STEEL LIQUID LEVEL GAGES

Liquid shows black—empty space shows white. Preferred wherever liquid level must be easily and positively visible . . . and when liquids are under high pressure or at high temperature.



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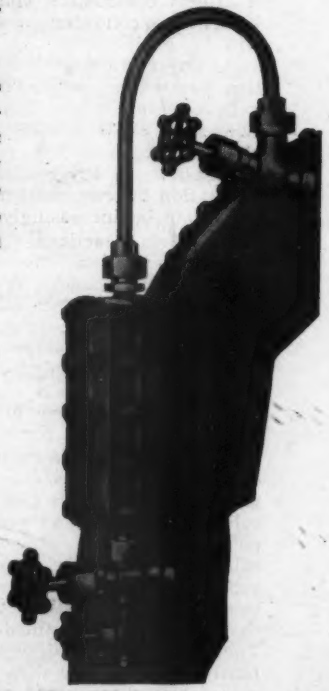

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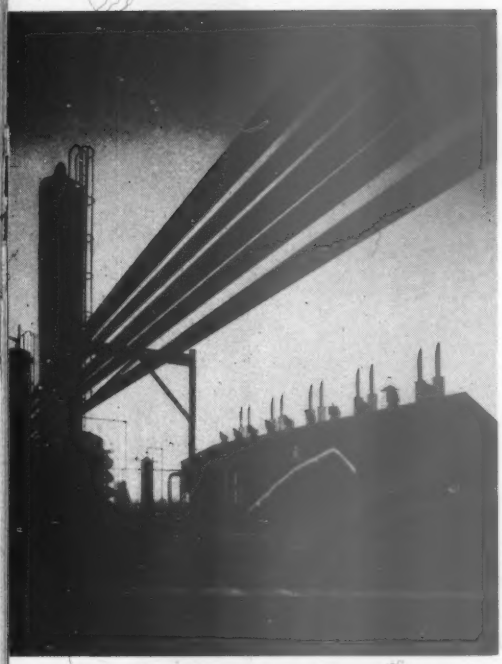


One of the modern Illinois natural-gasoline plants showing the fractionators, overhead piping and engine house

injected by a pump or otherwise then the volatility of the fuel, per se, is of little moment so far as it affects the problem of getting the fuel into the cylinder. It probably will be injected immediately preceding the instant of ignition and volatility will have a decidedly secondary role, mainly as it affects combustion characteristics. Under these conditions, octane number will be as important as at present, more important doubtless as combustion properties become more critical with mounting compression pressures. Therefore, while volatility will in all likelihood remain the natural-gasoline man's primary commodity, antidetonation improvement now appears certain to be increasingly important.

The twin reactions of alkylation and isomerization offer what now seems to be the most likely solution to both problems—decreasing too high volatility of butanes and propane, and improving the octane number of the less volatile, higher molecular weight material when and after the lighter, higher octane number fractions are removed. Natural gasoline may be sold to refiners or operators of alkylation-isomerization plants for processing, in which case it will be sold at essentially a "raw material" price. It may be processed by its original producer, or in combination-cooperative units, in which case the production costs will be greater, and the output sold as a finished product. The economics of either course cannot be foretold now with any degree of certainty; we know more nearly what it will be for the conventional natural-gasoline production than for its processing to enhance its value.

For alkylation of light hydrocarbons, from propane upward, three or four steps are necessary. A portion of the normal hydrocarbons must be isomerized as one of the two primary charge stocks. Another portion must be dehydrogenated, to supply the olefin part of the charge; these two portions must be alkylated under the required conditions and with the most advantageous catalyst to obtain the best results. Each step requires catalysis. In the case of both aluminum chloride, HCl and of HF, units are operating or building which employ the same catalyst for isomerization and for alkylation. Dehydrogenation requires the use of a different type of catalyst and considerably higher temperatures, as high as 1,200° F. being recorded as necessary for dehydrogenating butane, etc., along with catalysts of the metal oxide type. It appears that dehydrogenation is the most expensive of the three steps. In many many cases at present, the olefins used in alkylation are obtained by concentrating them from the tail gases of thermal or catalytic-cracking plants, rather than as an out-and-out new, separate operation for the specific purpose of forming olefins from paraffins.

On the other hand, isomerization requires only one step, in addition to those of concentrating, by distillation or otherwise, of the raw charge from undesired diluent hydrocarbons, and of segregating the isomers from the uncharged material after passing through the reaction zone. These auxiliary steps are, of course, common to both alkylation and isomerization, so that one catalytic reaction is needed for isomerization, to three for alkylation, assuming that normal paraffins are the original stock.

Isomerization Economic Process

Under these condrtions, the operation of an isomerization unit will certainly require a lower capital investment than will an alkylation unit, say of the order of magnitude of one-third to one-half as much (costs at present hardly reflect those expectable when peace returns and should not be considered too seriously when planning postwar building). Over-all yields from isomerization reportedly are above 90 per cent. or of that order, whereas yields from alkylation, starting in each case with the predominantly normal paraffins from natural gasoline may be one-third less, or of the order of 60 per cent of the original charge. Assuming a 90 per cent yield for purposes of calculation, the cost of raw charge to make a gallon of isobutane—if the butane is salable only as natural gasoline—is estimated at 3.875/0.90 cents = 4.305 cents per gallon. The practical feasibility of installing and operating a butane isomerization unit depends, then, on the market price of isobutane and on the demand for the finished product. Can isobutane be sold at a price enough higher than 4.3 cents to pay for the processing and show a profit? Is the market stable enough to be reasonably certain of selling isobutane in the quantities produced? Of course, if L.P.G. butane is processed, the raw material cost will be about one-third lower, at typical prices.

Another line which may be open for the natural-gasoline maker to follow is a combination of:

1. Separation of isoparaffins from raw natural.

2. Isomerization of the remaining normal paraffins, in different fractions or with all in a single charge.

3. Disposal of the isomeric products, part as charge for alkylation operations, part—the heavier portions—as finished blending stocks for motor or aviation fuels, or in other ways which developments may make practicable.

To illustrate: assume a raw natural of 26 lb. or higher, containing any probable percentage of normal and isobutanes, pentanes, hexanes and higher. It is theoretically and technically practicable to separate the iso from the normal paraffins in each case; dispose of the isobutane and isopentane for alkylation charge, or the isopentane as blending material for aviation or motor fuel; higher isoparaffins can be segregated as motor fuel or aviation components, depending chiefly on the octane number of the individual products; the normal paraffins may be isomerized separately or the entire production lumped into one charge and isomerized simultaneously in the same unit, to obtain a product with octane rating high enough to make a desirable component for motor fuel. A mixture of normal pentane-to-octane may vary in octane number from zero to 25 or 30, depending on the individual case and on the amounts of isomers and lighter products in the run-of-mine streams from a practically operated plant. According to unpublished results which are known low-grade materials, such as that mentioned, may be improved to 50-70-octane range; yields and costs are not known definitely.

Alkylation of natural-gasoline hydrocarbons doubtless will require a greater concentration of charge stock; that is, larger units than will isomerization, although again this statement may be open to question. Because of the more involved and expensive installation for alkylation, processing of larger quantities will probably be necessary to make the operation an economic proposition. One source has estimated 1,000 bbl. per day of product as the probable safe minimum size of plant which may be considered at present. However, alkylation plants have been operated for some time, using aluminum chloride or sulfuric acid as catalysts.

Corrosion in Distillate Wells

*by T. S. Bacon and E. A. Brown**

THE typical distillate field requires large amounts of steel pipe, valves, and fittings for its development and operation. Many of the presently known distillate fields should operate for many years and prevention of corrosion of the steel equipment is essential if operating costs are to be kept at the lowest possible figures during the life of the field. Under present wartime conditions, proper maintenance of this steel equipment is even more important than in normal times.

External corrosion of steel equipment in the distillate field is entirely normal, may be detected in the usual way, and may be protected against, using well-known methods that have been perfected for low-pressure gas and oil-field equipment. There is a possibility that internal corrosion in the high-pressure distillate field may differ materially from internal corrosion previously observed in operations conducted at lower pressures. We have recently obtained some information regarding one case of rather unusual internal corrosion in a distillate field that might be of some interest if other similar cases are found in the industry.

Dissolved Iron Content

The Lone Star Producing Co. operates three distillate recovery plants at present. The Grapeland plant has been operated for about 3 years, the Opelika plant has been operated for about 2 years, and the Willow Springs plant has been operated for a little more than 1 year. All of these plants produce from 1 to 2 bbl. of liquid water per million cubic feet of gas processed, and this water is removed from the gas stream in the inlet separators at the plants. The dissolved iron content of this water is appreciable at all three plants, and will range from 200 to well over 1,000 p.p.m. of iron. This dissolved iron, may, of course, be present in connate water produced with the gas or may be dissolved from the iron equipment used to convey the gas from the formation to the plant. It appears that at least some of this iron has been dissolved from the gathering systems in all of our three plants.

The well-head fittings have been inspected internally at all three plants. Fittings at Grapeland show some pitting, well distributed over the internal surface of the various pipe and fittings with no serious reduction in strength of these items. Internal inspection of well-head fittings at Willow Springs show some removal of metal with a fairly smooth surface left and with well-distributed metal removal, so that the items are not materially weakened.

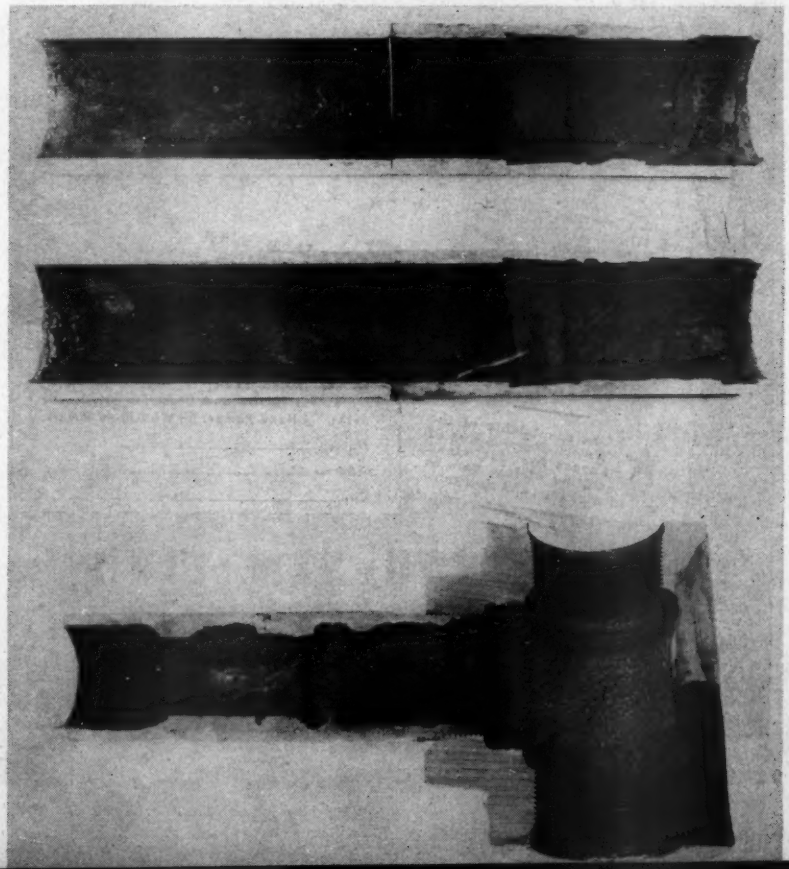
Internal corrosion at Opelika is very different from that at Grapeland and Willow Springs as shown by visual inspection. Serious and highly localized corrosion of the internal pipe surfaces occurs immediately downstream from the various fittings and orifice plates as a rule, and straight runs of pipe are corroded only slightly. Fig. 1 shows an example of this corrosion at Opelika. The rate of corrosion at Opelika is sufficiently great to cause condemnation of some fittings after only 90 days of service.

The gas at Opelika has been examined for constituents that might be corrosive. Carbon dioxide is present to the extent of about 1 per cent by volume. Traces of hydrogen sulfide are also present, but test results indicate that the hydrogen sulfide concentration does not exceed 0.1 grain per 100 cu. ft. The water produced with the gas contains less than 1,000 p.p.m. of chlorides, and less than 1,500 p.p.m. of total solids, so is a very dilute salt solution. The pH of the produced water is from 5.0 to 6.0 at the well. No other corrosive compounds have been identified.

The serious nature of the corrosion at Opelika was first observed in September 1942. Preventive work was started in the last part of December 1942. This work at present involves some correction of the pH value of the produced water by injection of soda-ash solution into the gas stream at the well. The Opelika wells are produced through tubing only, in all cases. A solution of ½ lb. of soda ash per gallon of water is pumped down the casing at a rate of approximately 2 gal. of solution per 1,000,000 cu. ft. of gas produced.

The water samples obtained at the well head show pH values ranging

Fig. 1—An example of corrosion at Opelika, showing how fittings are attacked



*Lone Star Producing Co.

5 STAR EDITION
WASCO NEWS
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W-S Line of Forged Steel Fittings Meets Wide Range of Needs
The complete line of Watson-Stillman Forged Steel Fittings includes Screw End Fittings and Socket Welding Fittings — 90° Elbows, Tees, 45° Elbows, Crosses, Street Elbows, Laterals, Couplings, Reducers, Bushings, Caps, Plugs, and Unions. These products are made from solid steel billets by manufacturing methods which insure uniform wall thickness, maximum wall strength and absolute concentricity. Bulletin A-3 describes and illustrates the complete line.
New Valves Recently Added to the W-S Line
Specially designed for hydraulic service, Watson-Stillman high-pressure valves are now supplied in several types never before furnished. Many former W-S Valves have been redesigned and engineering improvements introduced. Retained from previous models are features developed throughout the manufacturer's near-century of hydraulic experience. The line is described and illustrated in a recently-published Bulletin A-4.
W-S Hydraulic Jack Line Features "Double Diamond" Quality
Among the first Watson-Stillman products to be manufactured as a standard item, hydraulic jacks now appear in a redesigned line offering the high quality always associated with the W-S "Double Diamond" Trade Mark. Included in this line are Independent Pump Hydraulic Jacks, Vertical Outside Pump Hydraulic Jacks, Horizontal Outside Pump Hydraulic Jacks. Bulletin 710-A gives factual information on this line.
5 STAR EDITION
Complete Hand Pump Line Draws on W-S "Know-How"
Designed and built to operate jacks and other small hydraulic tools and machines, Watson-Stillman Hand Pumps are backed by an experience of 95 years in the manufacture of hydraulic equipment. This line includes Single Plunger and Double Plunger Hand Pumps and Pumps with large, medium or small tanks. Bulletin 240-A describes and illustrates W-S Hand Pumps, and is available on request.
W-S Hand and Hydraulic Shears Cut Fast and Clean
The adaptability of the Watson-Stillman line of shears for fast, clean cutting of iron bars as well as wire rope and steel cable fits the wartime tempo of speeding up production. Only a change of blade is required to adapt W-S Hand or Hydraulic Wire Rope Shears for cutting flat bar iron or round iron. All parts of W-S Shears are interchangeable. Additional information is furnished in Bulletin 740-A.
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from 7.0 to 8.0 after injection of soda ash, and chemical tests indicate iron contents of water samples at the well head ranging from 5 to 30 p.p.m. In this connection, water samples obtained at the well heads without soda ash injection showed iron contents of from 150 to 300 p.p.m. Visual examination of the well-head fittings is not conclusive at present due to the relatively short time of soda-ash injection. A cast-steel cross shows slight corrosion after 2 months of service on a well protected by soda-ash injection. It is believed that this corrosion is materially less than would be expected in the absence of soda ash. A small, single-acting, plunger pump driven by a gas-actuated diaphragm is used to pump the soda-ash solution into the casing. The gas required to drive the pump is obtained from the flow line from the well. Some mechanical trouble has been experienced with pump valves and packing in this service and pump maintenance has required an excessive amount of field labor. However, slight changes in the mechanical design of the liquid ends of these pumps are being made, and it appears that these changes have increased the reliability of these units.

It is possible that some corrosion inhibitor might be used, either alone or in conjunction with the soda-ash solution, to give better results. We have not investigated the possibilities of inhibitors in this connection to any appreciable extent to date. Some form of electrolytic protection, such as the insertion of zinc plugs in the internal pipe surface, has been suggested.

Tubing was pulled on one well and was found to be in almost perfect condition with only slight signs of attack on the bottom of each joint of tubing. The christmas-tree flange immediately above the tubing was appreciably corroded over its entire internal surface, and the master tubing gate was badly corroded. This examination indicated that corrosion started immediately on leaving the tubing and reached its maximum intensity at this point. A complete examination of the internal surface of the field line is, of course, impossible, but examination of the plant end of the field line showed negligible corrosion. No corrosion has been observed in the plant itself.

The Opelika distillate field presents an important maintenance problem at present due to internal corrosion at the well heads. We feel that we have arrived at a partial solution of this problem, but that there is much still to be learned both as regards the cause of this corrosion and as regards the cure. Cooperative effort on the part of the industry should assist in solving this problem and would be of value in the conservation of critical materials.

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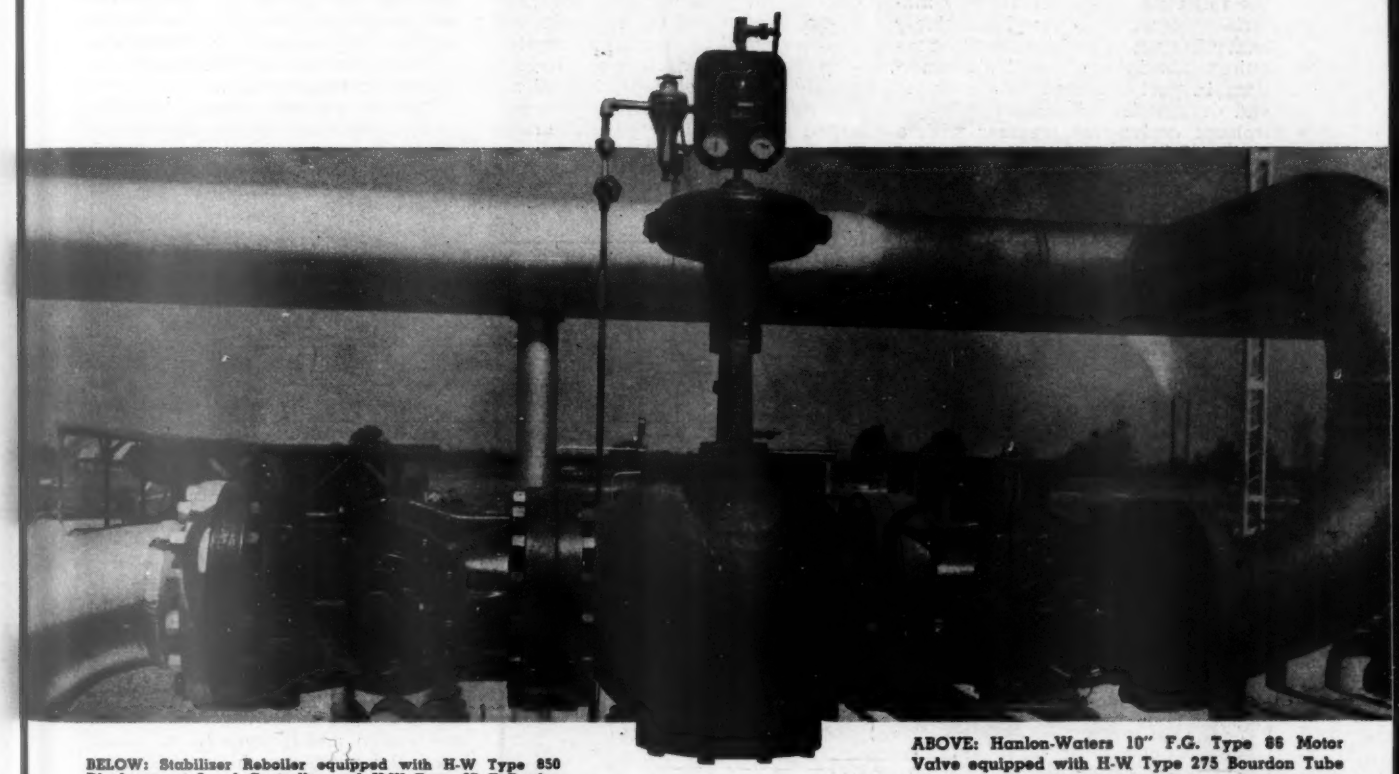

ABOVE: Hanlon-Waters 10" F.G. Type 86 Motor Valve equipped with H-W Type 275 Bourdon Tube Actuated Pressure Pilot and Type 245 Operating Medium Strainer Reducing Regulator on back pressure control installation.

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War Products From Natural Gas And Natural Gasoline

*by Paul M. Raigorodsky and Frank H. Dotterweich**

THE growth of the petroleum industry during peacetime was accompanied by the production and processing of such great quantities of crude oil that full consideration was not given to the effective utilization of the full range of petroleum raw materials in meeting the increasingly heavy burden of finished product requirements in wartime. This condition, in part, resulted in the waste and devaluation of certain light petroleum derivatives together with a disregard of their use not only as a source of fuel and energy but as a potential source of many chemical and other useful products. Today the rapidly increasing tempo of war activities, accompanied by decreasing crude reserves, shortage of critical materials and transportation difficulties, dictates that all petroleum fractions shall be processed for the most efficient use in the war effort and under these conditions the processing of natural gas and natural gasoline becomes of the greatest importance. In this paper, major attention will be given to the actual commercial processes by which these light-petroleum fractions may be converted into vital war products.

*Assistant director and consultant, respectively, of the Natural Gas and Natural Gasoline Division, PAW.

The increasing importance and value of natural gas and natural gasoline in the war effort may be attributed, in part, to their comparatively large volumes available and the low critical material requirement for their production and processing. By modern methods of fractionation light hydrocarbons may be separated into relatively pure saturated hydrocarbons, valuable in their pure state as blending agents, or when processed by modern catalytic and thermal processes still more valuable as raw material giving remarkable yields of war products. Natural gas is invaluable not only as a source of war products but also in the proper development and production of recently discovered condensate fields due to the complexing phenomena of retrograde condensation.

The future should see increased discoveries of deep petroleum deposits of the "vapor state" type in which the recovered light-petroleum fractions will be a greater percentage of the total petroleum products than heretofore, thereby insuring increasing supplies of natural gas and natural gasoline and perpetuating their use in developments which have been accelerated, and in some cases, forced upon the petroleum industry during wartime.

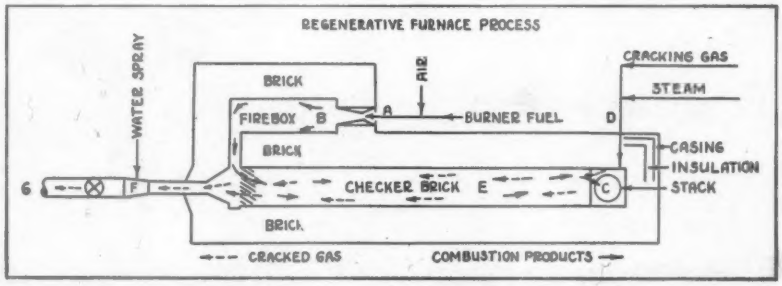


Fig. 1—The cycle in regenerative-furnace operation offers a method for producing butadiene and by which ethane-propane mixtures may be cracked to ethylene, propylene and benzene mixtures

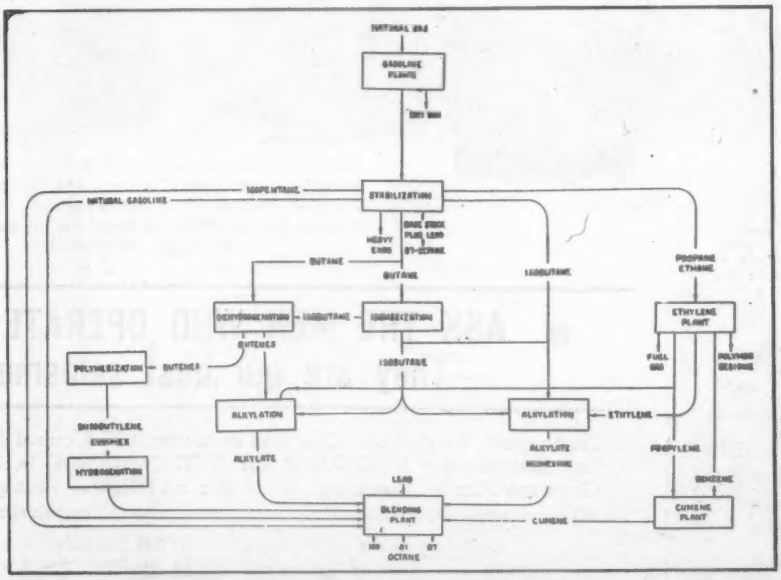


Chart 1—Illustrating the general processes for producing aviation gasoline from natural gasoline and condensate

These conditions, relative to the supply and scientific developments, in natural gas and natural gasoline operations have made possible the production of war products, the most important of which are synthetic rubber, carbon black, aviation fuel and explosives. Many of these developments cannot be reviewed herein due to wartime restrictions, but a general report on some of the more important commercial developments and of processes available for commercial development will to a certain degree show that natural gas and natural gasoline play a most important role in the war.

In the production of butadiene by the catalytic dehydrogenation of nor-

mal butane the commercial process of the greatest importance is the Houdry one-stage and combined two-stage dehydrogenation catalytic processes. The dehydrogenation occurs in six special catalytic reactors, operated under subatmospheric pressure and at carefully controlled temperatures.

The two-stage process which has been reported[1] is now being constructed by the Standard Oil Co. of California, which should go on stream in the near future.

The one-stage process will be used in one of the Sun Oil Co.'s plants which should go into commercial production of 15,000 tons of butadiene per year, early in May.

Difference in Processes

The one-stage process differs from the original two-stage process by injecting the fresh butane feed with the recycled butane-butene mixture. In this setup there would be two cases operating on butane-butene for 10 minutes or less, two cases regenerating and two cases purging. The reactants flow only upward through the catalyst bed, thereby effecting economies in the size and number of connections to the cases. This method necessitates increased amounts of air and butane or the injection of 746 bbl. per day of normal butane to manufacture 15,000 tons of butadiene per calendar year, against 660 bbl. originally reported. The most astonishing factor concerning this plant is its construction with practically all second-hand material. New critical material requirements have been limited to small items such as the large vacuum cylinders on compressors, some valves, instruments, and other similar materials. It is very interesting to note the material requirements for this plant when compared with the original estimated requirements. The complete amount of critical material, which it was necessary to purchase under priority for the entire butadiene plant, including dehydrogenation and purification sections and also auxiliary equipment, such as new boiler house, electric power services, water services, etc., amounted to 719.8 tons as against the original estimate of 850.6 tons.

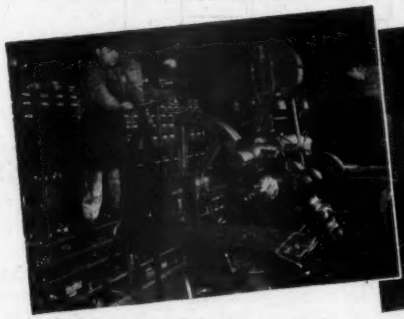
Many refinery conversion projects in the "quickie" program have been canceled including projects using the Houdry process. It was stated and should be noted that the reason for cancellation of the Houdry units was entirely due to the late date of their construction. A pilot plant with one case of commercial design and size is in continuous operation at Marcus Hook, Pa., and operating data substantiates claims relative to the efficiency of the Houdry process.

This process continues to be most desirable in the production of butadiene because butane and not butylene is the charging stock. Large quantities of butane are available in

Who Says . . .

IT CAN'T BE DONE!

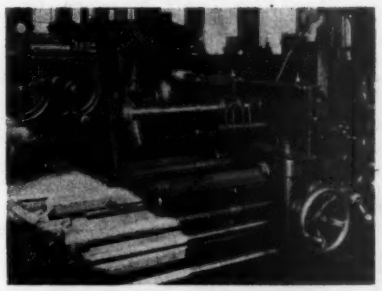
This war is not being won simply because we have an abundance of machine tools and machine operators. It's that intangible thing called "will power" plus the machines and men that is pacing us to victory. Take Oil Center as an example. Today, without benefit of special machine tools, we are producing urgently needed parts for cargo vessels that, a year or two ago, we probably would not have attempted to manufacture without special machine tools. Without precedent or guide of any kind, we have made special fixtures for our machines that are enabling us to do the impossible. A few examples are illustrated below.



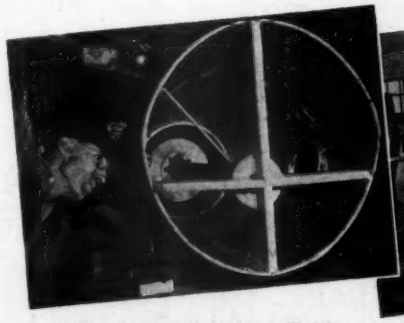
A milling machine with special rigging machines odd-shaped parts that would have required several separate machining operations and welding.

A slotting machine with small electric motor attached to drive the cutter, takes the place of a milling machine on this job.

O-C-T proudly flies this prized Treasury Flag because 100% of its employees are buying war bonds and stamps.



Engine lathe with improvised fixtures and I-beam extensions being used on a drill press or milling machine job.



A difficult horizontal boring mill job being done on an engine lathe. Note how raising blocks lift the spindle so that the job will clear the carriage.

This engine lathe, "jacked up" with raising blocks, is now big enough to do the job that would ordinarily have been done on a boring mill.

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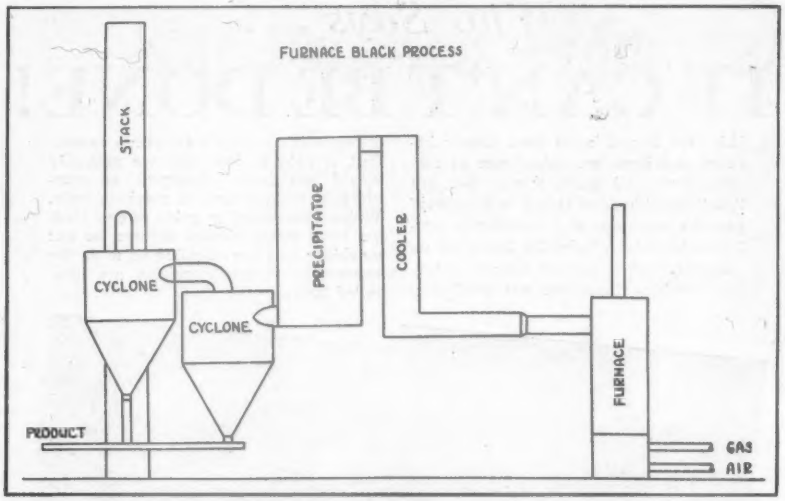

Fig. 2—Carbon black produced in the furnace goes to the cyclone stage and electrical precipitation apparatus

many localities while available butylenes are scarce due to great demand for the aviation-fuel program.

Butadiene can be made from a number of diversified raw materials coming from agricultural and mineral sources and one of the most important raw materials available from both sources is ethyl alcohol.

The many possible processes available to convert ethyl alcohol into butadiene have been carefully reviewed and reported.[2] In this reference, these processes are classified into the following general groups: (1) Direct conversion of ethyl alcohol; (2) the aldol method; (3) ethylene methods; (4) acetylene methods; (5) acetaldehyde condensations and conversion to butadiene, and (6) crotonaldehyde methods.

When natural gas is the raw material in the production of ethyl alcohol, its separation is confined to the following groups; dry gas, ethane-propane mixture, and natural gasoline. The ethane-propane mixture is thermally cracked into ethylene which is reacted first with sulfuric acid, then with water, with ethyl alcohol as the product. This method is being used commercially to produce ethyl alcohol with the sulfuric acid being recovered, concentrated, and recycled.

Direct Conversion

Under other conditions when natural gas is the raw material the direct conversion, aldol, and acetaldehyde condensation methods are of importance.

It appears that at the present time alcohol manufactured from natural gas is not being used to produce butadiene. However, a plant is now in commercial production of butadiene from alcohol with most encouraging yields using the two-stage method of conversion. It is interesting to note that in this plant the original design called for the production of alcohol from ethylene as previously indicated.

Regenerative Furnace Method

Petroleum Chemicals, Inc., has designed and built at their Baltimore plant a semicommercial unit for the cracking of hydrocarbons by regenerative heating and for the separation and purification of the olefins produced. This type furnace was partially developed by the Tennessee Eastman Corp., under the supervision of Dr. R. L. Hasche[3] in connection with the production of acetylene by thermal cracking and has been adapted to the production of butadiene utilizing heavy naphtha as charging stock, and it is reported that a yield of 5.2 weight per cent of butadiene was obtained.

For a discussion of the furnace together with its operation, reference is made to Fig. 1.

During the firing cycle, fuel gas and air are fed to the pressure burner at (A). Combustion is complete in the fire box at (B), the air supply may be closely regulated to give practically no excess air and the products leave through the stack (C), steam purges at the end of the cracking, and firing cycles prevent contamination of the product. The vaporized feed at about 500° F. is mixed with low-pressure steam and fed to the furnace at (D). Cracking is effected over the carborundum checker work, previously brought to heat in the firing period, and the cracked products on leaving the furnace are cooled by means of direct water sprays to about 130° F., then conducted to concentration and purification apparatus.

The development of the modern regenerative furnace is not only of importance as a possible method of butadiene production from condensate, but offers a splendid method by which byproduct ethane-propane mixtures may be cracked to ethylene, propylene and benzene mixtures. These raw materials are of importance in the manufacture of aviation fuel and this subject will be discussed herein.

It is reported that the operation of the regenerative furnace is superior to the commercial method of tubular cracking when over-all yields of desirable unsaturated hydrocarbons are of importance.

Carbon Black

The development of synthetic rubber and its increased production is being accompanied by increased production of new types of carbon black

(Continued on Page 102)

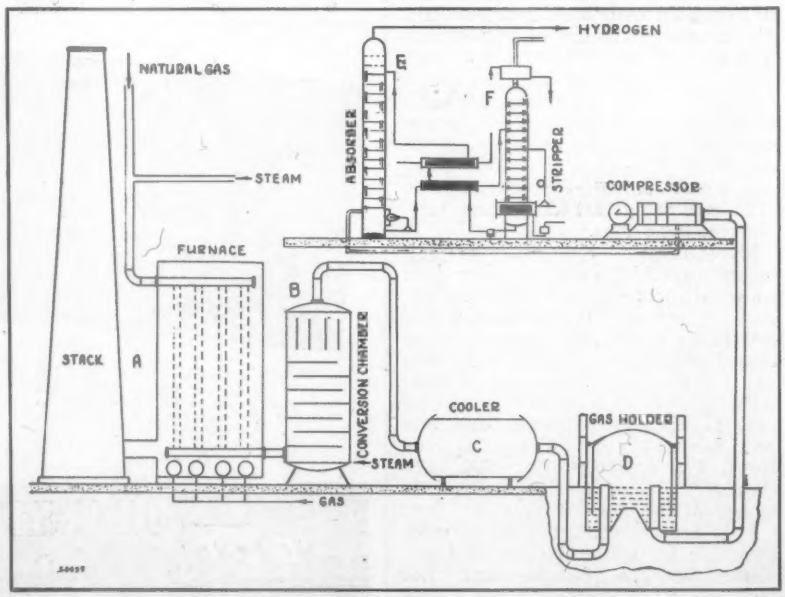

Fig. 3—General outline of steam conversion process for producing hydrogen from natural gas

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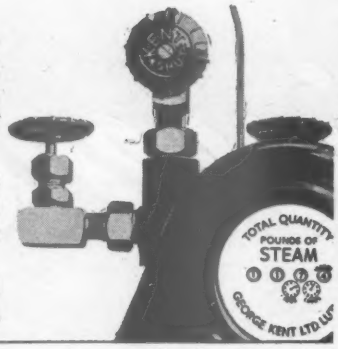

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essential in compounding procedures. In the past, natural gas has been the raw material in the production of cannel blacks required in compounding natural rubber, and this raw material continues to supply the newer types of carbon black, i.e., furnace and thermatomic blacks which are required in compounding synthetic rubber.

The necessity of increased production of furnace and thermatomic blacks may be explained by the properties of carbon black when compounded with natural and synthetic rubber.

With the advent of synthetic rubber, changes in carbon-black production and blending were imminent. This, in part, was brought about because synthetic rubber has a low tensile strength, necessitating the use of carbon black in greater amounts and in certain portions of the tire and tube where heretofore it was not used.

In addition, synthetic rubber does not bounce to the same extent as natural rubber, resulting in a greater portion of energy being converted into heat. These conditions dictate that heat generation be kept to a minimum by increasing particle size and decreasing hardness and abrasive resistance to impart an over-all maximum wearing quality to synthetic-rubber products. To obtain these softer blacks, processes other than the channel must be employed and today large quantities of this material are being manufactured by the furnace and thermatomic methods.

Furnace Black Process

The furnace process may briefly be explained by reference to Fig. 2. In this process natural gas is burned under carefully controlled conditions with definite proportions of air to give the quality of black desired. The products are piped from the furnace to cyclone and electrical precipitation apparatus where the black is recovered and prepared for shipment. In general the efficiency of this process increases with increased particle size with yields of from 3 to 20 lb. per 1,000 cu. ft. of gas against a yield of from 1 to 5 lb. in the channel process.

Soft blacks may also be manufactured by thermatomic cracking operations. In this method carbonaceous vapors or gases are heated to a decomposition temperature by external heating with or without air in the forming chamber.

The participation of the natural-gasoline industry in the production of aviation fuel needs no introduction; the economics and practicability of the use of natural gasoline is verified in that at the present time 30,000 bbl. per day are going into the manufacture of 87, 91 and 100-octane fuel, and by the end of 1943 this figure will approach 70,000 bbl.

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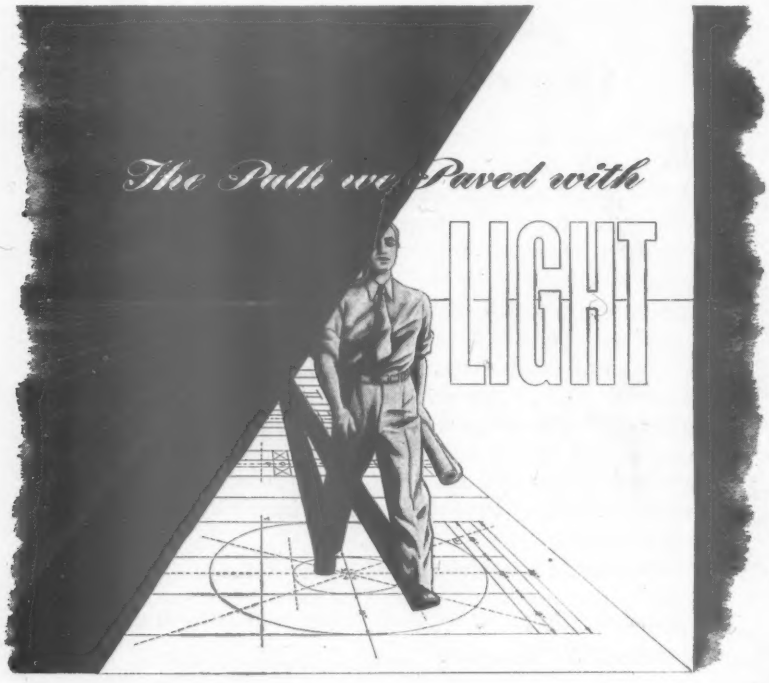
per day. In addition it is estimated that approximately 175,000 bbl. per day of natural gasoline and condensate are going into motor fuel, and a considerable portion of this may be made available for aviation-fuel production. The imminent shortage of petroleum products must not be construed as being accompanied by a shortage of natural gasoline and condensate. On the contrary sufficient raw materials are available and this amount may be increased by producing proven condensate reserves. New equipment will be required to produce and stabilize the desired amount of natural gasoline but the over-all new material requirement is very small when compared to that amount required to drill new wells, transport and prepare a similar quantity and type of hydrocarbon raw material from petroleum.

In processing natural gasoline and condensate, modern methods of stabilization, isomerization, dehydrogenation, polymerization, hydrogenation and alkylation may be employed. Chart 1 illustrates the general processes by which natural gasoline and condensate may be used to produce the desired aviation fuel.

The value of natural gasoline blending agents now in commercial production, including isopentane, is well known but with more exact specifications for superfuels, together with the current picture of critical material and crude oil, any new blending agent possessing superior blending qualities is of importance. Under these conditions the great possibilities of catalytic and thermal conversion of relatively pure light-hydrocarbon fractions into base stocks and the processing of these stocks into superaviation blends must not be underestimated. As previously stated the thermal cracking of byproduct propane and ethane, in regenerative furnaces, into ethylene, propylene and benzene is of importance. Ethylene with isobutane, natural or isomerized from normal butane, has in the past produced neohexane, a superblend. The future may see the same raw materials, ethylene and isobutane, producing superblends of still greater value. Propylene and benzene are now being alkylated to produce cumene, a superrich mixture blend, and in addition cumene may be thermally cracked to give a 50 per cent yield of styrene for synthetic-rubber production.



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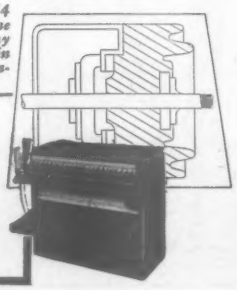

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The significance of ammonia in wartime is evident. Woodward[4] has discussed this subject in detail and lists various nitrogen compounds used in modern warfare which are derived from ammonia. The oxidation of ammonia yields nitric acid and this acid with ammonia yields ammonia nitrate. With these base materials explosives are prepared which are being used in great quantities for charging airplane bombs, shells and other projectiles.

In the synthesis of ammonia, of the gases used the most expensive and difficult to obtain is hydrogen. Today approximately half of the emergency synthetic ammonia is prepared with hydrogen obtained from natural gas by the steam conversion process.

A general outline of the steam-conversion process[5] may be obtained by referring to Fig. 3. The initial reforming is carried out in the furnace, (A). This radiant-type downflow furnace, gas-fired, is maintained at a temperature of 1,600° F. The gas to be processed, plus steam, is passed through tubes packed with catalysts. The reaction taking place in this stage is as follows:

$$CH_4 + H_2O \rightarrow CO + 3H_2$$

In this stage approximately atmospheric pressure is maintained in the system. The gases are then conducted

to the converter, (B), where additional steam is added and at a temperature of 850° F. with another type catalyst, the production of hydrogen is completed:

$$CO + H_2O \rightarrow CO_2 + H_2$$

The gas is then cooled at (C), and conducted to the gas holder (D), before being compressed. The analysis of this gas, at this point in the system, is reported to be roughly 78 per cent hydrogen, 20 per cent carbon dioxide, and 2 per cent unconverted hydrocarbons and other gases. It is extremely important that the natural gas used in this process be free of any sulfur compounds, such compounds resulting in catalyst poisoning.

The gas could be scrubbed of its carbon dioxide content at (E) and the scrubbing medium revivified at (F) should hydrogen of 97 per cent purity be required. However for the ammonia synthesis one volume of nitrogen with three volumes of hydrogen are required and this ratio may be obtained by bubbling the hydrogen mixture through liquid nitrogen thereby supplying the desired nitrogen and attaining purification in one step.

Natural gas may be partially oxidized with air and the hydrogen-nitrogen mixture purified. However this method does not supply the required amount of hydrogen and must be supplemented by pure hydrogen obtained from another source.

Potential of Nitroparaffins

Synthetic ammonia is not only of importance in the production of explosives, in addition it is used as a fertilizer base, rubber accelerator and in the preparation of nitroparaffins.

The exploitation of nitrated products of aromatic hydrocarbons has resulted in the production of some of our most powerful explosives such as TNT. It is very possible that future exploitation of the nitroparaffins may produce explosives of such a nature that natural gas may develop into a still more valuable source of explosives than at present.

Benzene and toluene are valuable war products and may be produced by thermal cracking of lighter hydrocarbons; hexane and heptane fractions may also be catalytically reformed to these materials.

The raw materials required for the production of explosives, i.e., synthetic ammonia, toluene, etc., are not only of importance in wartime but future peacetime needs should see a steady increase in the production of these and similar type raw materials with developments in chemical processing, chief of which may be the plastic industry.

The great technologic developments in hydrocarbon chemistry have made possible the production of many war products in quality and quantity to successfully supply our armed forces. Products like silk and rubber, which cannot be obtained from their natural sources, are now being replaced by synthetic rubber, plastic goods and synthetic fibers. In addition, the rapidly expanding plastic industry supplies goods to replace critical consumer products requisitioned for war purposes. In these operations natural gas and natural gasoline supply ever increasing quantities of hydrocarbon raw materials which are of great value in the war effort.

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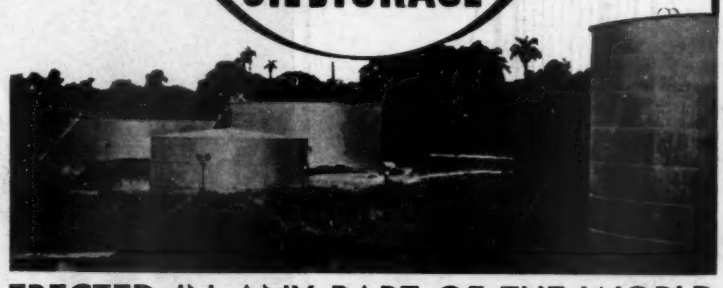

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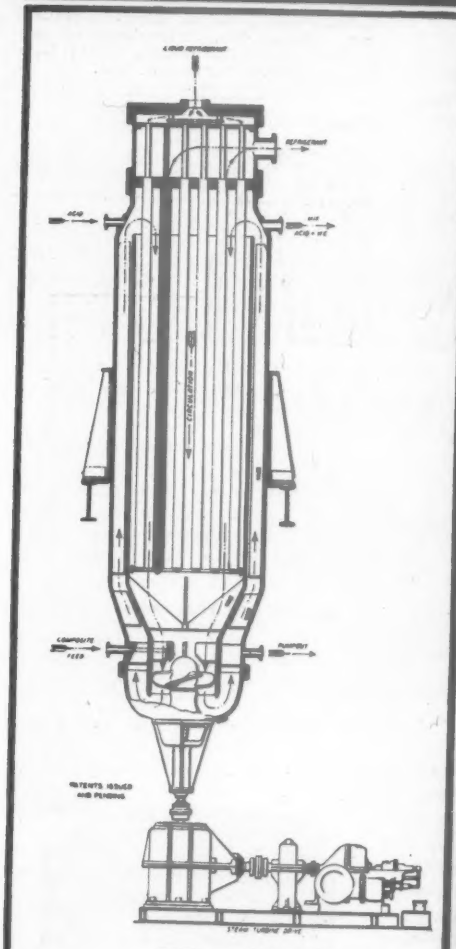

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Trend Toward More Precise Fractionation Accelerated In Natural-Gasoline Plants

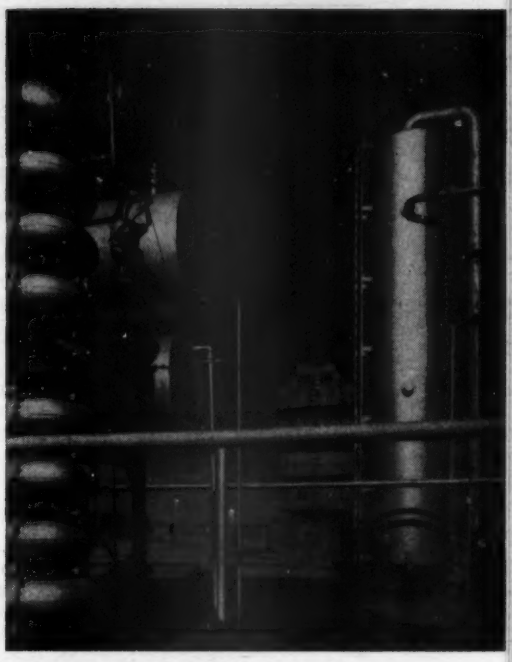
by H. Stanley Norman

WAR requirements and the prospective postwar demand for petroleum products are accelerating the trend toward closer fractionation of light hydrocarbons inherent in natural gasoline. This general conclusion is made significantly obvious by The Oil and Gas Journal's annual survey of natural-gasoline plants, their capacities and the nature of products they are qualified to recover.

Foundations upon which the natural-gasoline industry will build its postwar economy are now, in the opinion of analysts, firmly established. Enlarged markets are virtually certain for aviation gasoline, plastics, chemicals and other synthetic products derivable from petroleum hydrocarbons. The complex fractionating facilities installed in practically all natural-gasoline plants built in recent years is the nucleus around which the industry's postwar operations will be developed.

The natural-gasoline industry's modern manufacturing facilities, while serving during the war in the production of petroleum hydrocarbons of inestimable value, are actually more intimately related to peacetime economy and to prewar social trends. The war, placing a severe strain on the nation's natural resources, will stimulate the prewar social trends toward compulsory conservation of all available hydrocarbons in their most useful form.

The fundamental trend toward more precise separation of the liquefiable hydrocarbons in natural gas, instead of being a "war baby" and subject to abandonment at end of the conflict, is expected to move forward at a rapidly accelerated rate in the postwar period. Critical materials have not been freely available for nearly



Distillation unit in New Mexico showing heat exchangers, cooling tower and absorber

2 years and this natural deterrent to expansion, coupled with probably the most protracted period of uncertainty in any of the key war industries, have delayed many projects that otherwise would have been under construction.

Hampered by Discovery Shortage

The retarded rate of new oil-field discoveries also has reacted unfavorably on the natural-gasoline industry. Normal depletion in many of the older fields has made the installation of more complex fractionating equipment at existing natural-gasoline plants an uninviting procedure from an economic standpoint. Renewal of normal discoveries, either before or after the war ends, is accompanied by the assurance that natural-gasoline operations will follow apace.

Cooperative operations between oil producers and natural-gasoline manufacturers, already proven profitable and highly desirable by limited practice in prewar years, appear destined for more widespread acceptance. The necessity for pressure maintenance and secondary recovery through return of gas to the oil reservoir will require closer cooperation and even partial joint ownership between the producers and the natural-gasoline manufacturers. The desirable amalgamation of natural-gasoline manufacture and oil-producing operations, already accepted by the industry, is receiving increasing attention by state and national conservation authorities.

Conventional natural-gasoline operations, assuming a 26-lb. product as average in this classification, has re-

DISTRIBUTION OF PLANT CAPACITIES AMONG STATES

	No. of plants		Dly. nat.-gaso. cap. (gal.)	
	1943	1942	1943	1942
Arkansas	8	8	106,300	106,300
California	87	87	2,885,700	2,905,700
Colorado	1	1	6,000	6,000
Illinois	13	12	588,500	356,200
Kansas	14	13	346,800	349,300
Kentucky	2	3	50,000	50,000
Louisiana	29	29	640,775	635,775
Michigan	1	2	5,000	15,000
Montana	1	1	18,000	18,000
New Mexico	8	8	387,000	364,000
Ohio	7	7	48,200	48,000
Oklahoma	101	91	1,850,200	1,868,665
Pennsylvania	66	67	147,245	147,245
Texas	146	149	4,046,600	4,054,300
West Virginia	76	77	336,344	328,890
Wyoming	7	8	118,100	123,100
Detail total	567	563	11,580,764	11,376,475
Undistributed*	43	43	4,500	4,500
Grand total	610	608	11,585,264	11,380,075

*Plants in this classification are mostly small units used primarily for recovering lease-operation products.

DISTRIBUTION OF LIQUEFIED PETROLEUM GAS CAPACITY

	No. of plants recovering L.P.G.	Daily capacity (gal.)
Arkansas	1	20,000
California	22	425,000
Illinois	5	133,014
Kansas	4	29,000
Kentucky	1	7,000
Louisiana	7	86,000
Montana	1	9,000
New Mexico	4	60,000
Oklahoma	23	248,950
Pennsylvania	3	4,550
Texas	36	762,200
West Virginia	5	63,000
Wyoming	2	17,000
Undistributed (est.)	40	1,700,000
Total	154	3,564,714

Absorbers at one of the older natural-gasoline plants in Oklahoma

ceived little benefit by reason of the war. Operators anticipate that the postwar period will see a resumption of normal demand and production but anticipate little change in this category for a considerable period. A resumption of tanker loadings on the Gulf Coast will revert the business in that area back to approximately prewar levels.

Contrary to the prospects for central fractionation plants in condensate-recovery operations, there probably will be very few such units in the natural-gasoline industry because of the added cost of transporting raw materials.

One of the most certain postwar developments in the natural-gasoline industry is a resumption of the expansion in liquefied petroleum gas manufacturing operations. Bureau of Mines reports for 1942, admittedly deficient during early months of the year because of the newness of the new reporting forms to show L.P.G. production, show output of 674,478,000 gal. at natural gasoline and cycling plants. Marketed production of L.P.G. is estimated to have totaled 555,000,000 gal. last year, leaving 119,478,000 gal. in the total production which was diverted to purposes not reflected in sales.

PRODUCTION OF NATURAL GASOLINE, CYCLE CONDENSATE AND L.P.G.

(Thousands of gallons)

	Natural gasoline	Cycle products	Liquefied petroleum gas — Isobutane*	L.P.G.*	L.R.G.†
1942—					
January	179,928	61,362	10,080	63,126	9,954
February	168,840	54,684	9,156	51,576	10,248
March	173,082	59,346	10,248	52,164	9,660
April	161,490	47,754	8,358	45,192	12,768
May	170,436	53,760	9,534	48,426	21,798
June	162,792	52,206	9,492	50,946	21,042
July	170,478	54,600	10,080	50,610	20,622
August	173,082	56,028	9,534	56,532	18,606
September	173,250	54,978	9,324	56,364	17,010
October	180,390	57,078	10,626	56,658	13,272
November	167,790	55,902	11,424	65,436	17,094
December	170,058	57,834	10,332	77,448	20,160
Total	2,051,616	665,532	118,188	674,478	192,274
1943—					
January	157,332	58,800	12,054	72,534	18,438

*At natural-gasoline and cycle plants. †Liquefied refinery gas at refineries.

For the duration of the war, at least and possibly indefinitely if the synthetic-rubber industry maintains its emergency productive rate, greater emphasis may be placed on recovery of propane in natural-gasoline plant operations. Operations of the synthetic-rubber industry and the diversion of butane and isobutane to the production of aviation gasoline are enhancing the position of propane. Increasing volumes of butane are moving to isomerization plants and isobutanes are being segregated wherever practical for alkylation with unsaturates to produce 100-octane gasoline.

Shortages of critical materials and involuntary curtailment of operations in certain flush fields of the country because of their remoteness from transportation facilities retarded plant construction during the past year. But the new plants and recently installed equipment all aimed at the trend to closer fraction for the recovery of butane, propane, pentane and their

isomers. All liquefied petroleum gas available is avidly sought by domestic consumers, manufacturing industries and refiners engaged in the synthesizing of superfuels and the production of other war materials.

One of the significant trends apparent in natural-gasoline operations which is somewhat obscured by inability to obtain critical materials both for plant construction and for the special transportation facilities needed is central fractionation. There is some disagreement among leaders of the industry as to just how widespread this central-fractionation trend would move even under normal conditions. Operating conditions are limited under which one plant may draw conventional natural gasoline from several operations for further fractionation. This method of operation requires that sufficient stock be available, usually from several less complex plants within a limited radius. Otherwise, the additional cost of transportation nullifies the economic advantages accruing to the producer of propane, butane, pentane, etc.

The Journal's survey shows that 154 natural-gasoline plants in the country were equipped to recover liquefied petroleum gas as of April 1, an increase of 15 during the past year. Capacity for production of liquefied petroleum gas is approximately 3,564,-714 gal. daily which is an increase of 234,695 gal. over the 1942 potential, near 6,000 bbl. per day.

A net of four natural-gasoline plants were added to The Journal's survey this year but this apparent increase is contrary to actual trends because of a more complete return from certain areas than in the past, particularly in Oklahoma, where the current tabulation of 101 operations is a gain of 10. There are no substantial changes in any other producing state. Illinois and Kansas each gained one plant while Texas lost three and Kentucky, Michigan, West Virginia and Wyoming each dropped one plant, either through abandonment or transfer of equipment to other operations.

The increase of 204,289 gal. in the daily capacity of natural-gasoline plants which accompanied the comparatively mild net increase in the number of operations is significant. The trend to more complex plants has simultaneously dictated larger capacity in order to justify the elaborate facilities needed to fractionate, condense and handle the lighter liquefied gases.

Journal's Survey of Natural-Gasoline Plants

ARKANSAS

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Arkla Oil Co., Dallas, Tex., 11-20-28	40,000	.....
Carter Oil Co., El Dorado	10,000	.....
Magnolia Pet. Co., Kenova, Union County	8,000	.....
Shell Oil Co., Inc., Magnolia,* 23-17s-20w	35,000	20,000
Sklar, Sam, Trustee, R. D. Reserve, El Dorado	3,500	.....
Sklar, Sam, Trustee, Pratt, El Dorado	4,400	.....
Sklar, Sam, Trustee, Rainbow, El Dorado	3,200	.....
Sklar, Armstrong	2,200	.....
Total	106,300	20,000

*Atlantic Refining Co. et al own half interest.

CALIFORNIA

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Bankline Oil Co., Long Beach, Signal Hill	20,000	5,000
Barnsdall Oil Co., Elwood, 15-4n-29w	24,000	.....
Belridge Oil Co., McKittrick, Kern County	75,000	25,000
Belridge Oil Co., McKittrick, Kern County	75,000	.....
Brea Canyon Oil Co., Los Angeles, Brea-Olinda	14,000	.....
Coline Gasoline Corp., Torrance, Del Amo lease	25,000	3,000
Coline Gasoline Corp., Ventura, Rincon	15,000	10,000
Cowan Oil & Ref. Co., Belridge, Lost Hills	30,000	.....
Cowan Oil & Gas Co., Rosecrans	20,000	.....
Del Valle Gasoline Co., Saugus, Castaic	20,000	.....
Field, O. C., Gasoline Corp., Huntington Beach	50,000	5,000
Field, O. C., Gasoline Corp., Montebello	40,000	12,000
General Pet. Corp., Athens-Rosecrans	40,000	.....
General Pet. Corp., Santa Fe Springs	55,000	.....
General Pet. Corp., Brea-Olinda	20,000	.....
General Pet. Corp., Ventura	40,000	.....
General Pet. Corp., Wilmington	60,000	.....
Gilmore Dabney, Inc., Long Beach, Signal Hill	30,000	.....
Honolulu Oil Corp., Taft, Buena Vista Hills	30,000	.....
Inglewood Gasoline Co., Culver City, Baldwin Hills	6,000	.....
Inglewood Gasoline Co., Inglewood, Potrero	15,000	.....
Lomita Gasoline Co., Signal Hill, Jergins lease	50,000	.....
Lomita Gasoline Co., Mountain View	20,000	.....
Los Nietos Prod. & Ref. Co., Avenal, Kettleman Hills	100,000	45,000
Norwalk Co., Maricopa, Midway-Sunset	6,000	5,000
Norwalk Co., Santa Fe Springs	20,000	1,500
Pacific Western Oil Corp., Los Angeles, Elwood	20,000	.....
Pacific Western Oil Corp., Los Angeles, Ventura	25,000	.....
Rice Ranch Oil Co., Santa Maria, Orcutt	3,200	.....
Richfield Oil Corp., Richfield-Western, Coles Levee	32,000	.....
Richfield Oil Corp., Crampton, Elk Hills	†5,000	.....
Richfield Oil Corp., El Segundo	12,000	.....
Richfield Oil Corp., Hobson, Rincon	*15,000	.....
Richfield Oil Corp., Huntington	*15,000	.....
Richfield Oil Corp., Signal Hill, Long Beach	25,000	.....
Shell Oil Co., Inc., Fullerton, Brea	20,000	.....
Shell Oil Co., Inc., Bicknell, Capitan	5,000	.....
Shell Oil Co., Inc., Compton, Dominguez	25,000	.....
Shell Oil Co., Inc., Long Beach	80,000	.....

CALIFORNIA (Continued)

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Shell Oil Co., Inc., Bicknell, Santa Maria	2,500	.....
Shell Oil Co., Inc., Bakersfield, Ten Section	15,000	.....
Shell Oil Co., Inc., Ventura	90,000	.....
Signal Oil & Gas Co., Goleta, Elwood Terrance	10,000	.....
Signal Oil & Gas Co., Huntington Beach	27,000	.....
Signal Oil & Gas Co., Long Beach, Signal Hill	30,000	.....
Signal Oil & Gas Co., Long Beach	15,000	.....
Standard Oil Co. of Calif., Coalinga	10,000	12,000
Standard of Calif., Coles Levee	12,000	10,000
Standard of Calif., Greeley	20,000	.....
Standard of Calif., Huntington Beach	35,000	12,000
Standard of Calif., Inglewood	30,000	.....
Standard of Calif., Kettleman Hills	65,000	.....
Standard of Calif., Kettleman Hills	120,000	85,000
Standard of Calif., Kettleman Hills	100,000	.....
Standard of Calif., Long Beach	18,000	.....
Standard of Calif., Lost Hills	4,000	.....
Standard of Calif., Mountain View	12,000	2,000
Standard of Calif., Murphy-Coyote	40,000	.....
Standard of Calif., Santa Fe Springs	40,000	.....
Standard of Calif., Seal Beach	25,000	.....
Standard of Calif., Taft	15,000	10,000
Standard of Calif., Taft	17,500	.....
Standard of Calif., Taft	10,000	.....
Standard of Calif., Torrance	12,000	.....
Superior Oil Co., Coalinga, Kettleman Hills	100,000	35,000
Superior Oil Co., Bakersfield, Rio Bravo	16,000	50,000
Texas Co., Huntington Beach, Orange County	20,000	.....
Texas Co., Montebello, Los Angeles County	40,000	.....
Texas Co., Santa Fe Springs, Los Angeles Co.	50,000	.....
Texas Co., Shiell's Canyon, Ventura County	35,000	.....
Texas Co., Signal Hill, Los Angeles County	75,000	.....
Union Oil Co. of Calif., Brea-Olinda, Brea	22,500	.....
Union Oil Co., Compton, Dominguez	69,000	.....
Union Oil Co., Kettleman Hills	30,000	.....
Union Oil Co., Richfield	10,000	.....
Union Oil Co., Bakersfield, Rio Bravo	15,000	20,000
Union Oil Co., Rosecrans	27,000	.....
Union Oil Co., Santa Fe Springs	70,000	.....
Union Oil Co., Orcutt	15,000	6,000
Union Oil Co., Compton, Del Rey	24,000	.....
Universal Consolidated Oil Co., Los Angeles, Rosecrans	5,000	.....
West Coast Ref. Co., Placentia, Richfield	50,000	.....
Western States Gasoline Corp., Avenal, Kettleman Hills	160,000	45,000
Western States Gasoline Corp., Ventura, San Miguelito	10,000	6,500
Wilmington Gasoline Co., Wilmington	30,000	20,000
Wilshire Oil Co., Santa Fe Springs	*50,000	.....
Total	2,885,700	425,000

*Shut down. †Operated as a vacuum compressor plant.

COLORADO

Mountain States Oil Corp., Trinchera, 3-34s-62w	6,000	.....

ILLINOIS

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Arkansas Fuel Oil Co., Robinson, Prairie Twp.	300	.....
Brenneman & MacDonell, Oblong, 6-6-13	1,000	.....
Brenneman & MacDonell, Oblong, 7-7-13	200	.....
Carter Oil Co., St. Elmo, Louden	40,000	.....
Ohio Oil Co., Robinson, Crawford County	10,000	4,514
Sunflower Pet. Products Co., Salem	115,000	6,500
Sunflower Pet. Products Co., Benton	50,000	25,000
Texas Co., Salem, Marion County	187,800	.....
Texas Co., Hoodville	80,000	.....
Vacuum Gasoline Co., Bridgeport	2,000	.....
Vacuum Gasoline Co., Bridgeport	4,000	.....
Warren Pet. Corp., Crossville, White & Posey County	38,000	42,000
Warren Pet. Corp., Salem, Marion County	60,000	55,000
Total	588,500	133,014

KANSAS

Aldon Gasoline Co., Haven	3,000	3,000
Barnsdall Oil Co., Oxford, 20-33s-3e	8,000	1,000
Cities Service Oil Co., Arkansas City, 13-34s-3e	15,000	.....
Cities Service Oil Co., Burrton, 25-23s-4w	35,000	.....
Cities Service Oil Co., Haven, 17-24s-4w	25,000	.....
Cities Service Oil Co., Wichita, 17-28s-1e	50,000	.....
Flynn Oil Co., Tulsa, Otis	3,000	.....
Kansas Power & Light Co., Topeka, Medicine Lodge	10,000	.....
Kansas Power & Light Co., Topeka, McPherson	10,000	.....
Northern Natural Gas Co., Hugoton	25,000	.....
Panhandle Eastern Pipe Line Co., Liberal	100,000	.....
Skelly Oil Co., Cunningham, 30-27s-10w	40,000	15,000
Texas Co., Atlanta, Cowley County	7,800	.....
Warren Pet. Corp., Galva, McPherson County	15,000	10,000
Total	346,800	29,000

KENTUCKY

Kentucky-West Virginia Gas Co., Ashland	Under construction	
Virginian Gasoline & Oil Co., Catlettsburg, Boyd County	40,000	.....
Virginian Gasoline & Oil Co., Kermit, W. Va., Martin County	10,000	7,000
Total	50,000	7,000

LOUISIANA

Anchor Gasoline Corp., Tulsa, Eola	20,000	10,000
Arkansas Fuel Oil Co., Haughton, 7-17n-11w	16,000	.....
Arkansas Fuel Oil Co., Homer, 24-21n-8w	5,000	.....
Arkansas Fuel Oil Co., Rodessa, 26-23n-16w	25,000	600
Arkansas Fuel Oil Co., Shreveport, 34-18n-14w	15,000	.....
Arkansas Fuel Oil Co., Sibley, 36-17n-10w	20,000	.....
Arkansas Fuel Oil Co., Simsboro, 3-18n-4w	15,000	.....
Arkla Oil Co., Capps Plant, Rodessa	30,000	.....
Carter Oil Co., Shreveport, Caddo	10,000	.....
Carter Oil Co., Shreveport, Homer	10,000	.....
Coltexo Corp., Rodessa, Caddo Parish	40,000	.....
Continental Oil Co., Basile, 28-7s-2w	20,000	5,000
Continental Oil Co., Lake Charles, 14-9s-8w	20,000	.....
Continental Oil Co., Ville Platte, Evangeline Parish	75,000	60,000
Glen Rose Gasoline Co., Rodessa	15,000	7,000
Great National Oil Corp. of La., Ida, Rodessa	35,000	.....
Gulf Ref. Co., Mooringsport, Claiborne Parish	15,000	.....
Gulf Ref. Co., Mooringsport, Caddo Parish	8,000	.....
Ohio Oil Co., Cotton Valley, Webster Parish	7,740	2,400
Ohio Oil Co., Haynesville, Claiborne Parish	2,680	.....
Ohio Oil Co., Haynesville, Claiborne Parish	4,005	.....
Shell Oil Co., Inc., Iowa, 18-9s-6w	15,000	.....
Skelly Oil Co., Rodessa, 23-23n-16w	6,000	1,000
Stanolind Oil & Gas Co., Gilliam, Pine Island	3,000	.....
Texas Co., Lafitte, Jefferson Parish	10,350	.....
United Gas Pipe Line Co., Cotton Valley, 17-21n-10w	20,000	.....
United Gas Pipe Line Co., Koran, 31-17n-10w	18,000	.....
United Gas Pipe Line Co., Rodessa, 14-21n-15w	140,000	.....
United Gas Pipe Line Co., 6-19n-5w	20,000	.....
Total	640,775	86,000

MICHIGAN

Grimes, Otha H., Mount Pleasant, Greendale	5,000	.....

NEW MEXICO

El Paso Natural Gas Co., Jal, Lea County	50,000	25,000
El Paso Natural Gas Co.-Phillips Pet., Jal, Lea County	75,000	15,000
Phillips Pet. Co., Eunice, Lea County	100,000	.....
Phillips Pet. Co., Hobbs, Lea County	40,000	.....
Phillips Pet. Co., Lee, Lea County	37,000	.....
Shell Oil Co., Inc., Hobbs, 19-18s-38e	25,000	.....
Skelly Oil Co., Eunice, 27-22s-37e	30,000	5,000
Warren Pet. Corp., Monument, 36-19s-36e	30,000	15,000
Total	387,000	60,000

MONTANA

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Glacier Production Co., Cut Bank	18,000	9,000

OHIO

Hope Const. & Ref. Co., New Matamoras, Appalachian	1,200	.....
Ohio Prod. & Ref. Co., Eason, Wayne County	6,000	.....
Preston Oil Co., Elk, Noble County	2,000	.....
Preston Oil Co., Homer, Licking County	15,000	.....
Preston Oil Co., Pavonia, Richland County	10,000	.....
Preston Oil Co., Sugar Grove, Fairfield County	9,000	.....
Preston Oil Co., York, Medina County	5,000	.....
Total	48,200	.....

OKLAHOMA

Barksdale Gasoline Co., Hughes Co.	500	.....
Bartlett Gasoline Co., Butler	15,000	12,000
Barnsdall Oil Co., Avant, 18-23n-12e	3,000	200
Barnsdall Oil Co., Earlsboro, 15-9n-5e	45,000	20,000
Barnsdall Oil Co., Turley, 5-20n-12e	2,000	.....
Carter Oil Co., Fittstown, Fitts	45,000	.....
Carter Oil Co., Seminole	60,000	.....
Cimarron Gasoline Corp., Coyle	12,000	5,000
Cities Service Oil Co., Asher, 22-6n-3e	7,500	.....
Cities Service Oil Co., Holdenville, 7-6n-8e	25,000	.....
Cities Service Oil Co., Konawa, 9-6n-6e	12,000	.....
Cities Service Oil Co., Oklahoma City, 24-11n-3w	20,000	.....
Cities Service Oil Co., Oklahoma City, 31-11n-2w	20,000	.....
Cities Service Oil Co., Oklahoma City, 11-11n-3w	20,000	.....
Cities Service Oil Co., Seminole, 24-9n-6e	25,000	.....
Cities Service Oil Co., Seminole, 14-8n-6e	25,000	.....
Cities Service Oil Co., Seminole, 11-8n-5e	9,000	.....
Cities Service Oil Co., Tallant, 35-25n-10e	20,000	.....
Cities Service Oil Co., Wewoka, 19-7n-8e	6,000	.....
Continental Oil Co., Billings, 21-23n-2w	20,000	5,000
Crosbie, Inc., J. E., Fittstown, Pontotoc County	25,000	5,000
Deep Rock Oil Corp., Cushing	1,000	.....
Devonian Oil Co., Kellyville, 22-17n-10e	20,000	6,000
Eason Oil Co., Enid, 34-17n-4w	18,000	15,000
Frame Nat. Gasoline Co., Cleveland, 35-21n-8e	3,000	.....
Frame Nat. Gasoline Co., Cleveland, 19-21n-8e	1,700	.....
Grimes, Chas. W., and Otha H., Okemah	3,000	.....
Grimes, Chas. W., and Otha H., Weleetka	7,500	2,000
Grimes, Otha H., Wetumka	3,500	.....
Grimes, Otha H., and Roy O. Neal, Drumright	5,000	.....
Gulf Oil Corp., Tulsa, 1-21n-7e	1,500	.....
Gulf Oil Corp., Tulsa, 24-27n-5e	10,000	.....
Gulf Oil Corp., Tulsa, 16-17n-12e	18,000	.....
Gulf Oil Corp., Tulsa, 14-7n-6e	13,000	.....
Gulf Oil Corp., Tulsa, 7-8n-6e	23,000	.....
Johnson Oil Ref. Co., Cleveland, 27 and 28-20n-9e	200	.....
Knox Ref. Co., Garber	2,000	.....
Lone Star Gas Co., Hollis	12,000	.....
McBride, W. C., Tulsa, Avant	500	.....
Magnolia Pet. Co., Oilton, Creek County	9,500	.....
Magnolia Pet. Co., Graham, Carter County	5,000	.....
Magnolia Pet. Co., Davenport, Lincoln County	3,700	.....
Magnolia Pet. Co., St. Louis, Pottawatomie Co.	13,000	.....
Magnolia Pet. Co., Stonewall, Pontotoc Co.	30,000	.....
Mid-Continent Pet. Corp., Bristow, 22-17-7	20,000	.....
Mid-Continent Pet. Corp., 5-16-15	2,500	.....
Mid-Continent Pet. Corp., Morris, 12-13-13	2,500	.....
Mid-Continent Pet. Corp., Cromwell, 15-10-8	25,000	.....
Mid-Continent Pet. Corp., Stillwater, 13-18-1	10,000	.....
Neal Gasoline Co., Osage, 13-21n-8e	4,900	.....
Oklahoma Gasoline Plants, Inc., Drumright, 18-18n-7e	10,000	5,000
Oklahoma Utilities Co., Bristow, 20-16n-9e	5,000	.....
Panhandle Gasoline Co., Coyle, Lamont	4,000	.....
Peppers Gasoline Co., Oklahoma City	10,000	.....
Peppers Gasoline Co., Oklahoma City	30,000	.....
Phillips Pet. Co., Edmond, 31-14n-3w	40,000	.....
Phillips Pet. Co., Dill, 2-11n-8e	25,000	.....
Phillips Pet. Co., Denoya, 26-27n-5e	45,000	.....
Phillips Pet. Co., Eleven-Eleven, 24-11n-11e	10,000	.....
Phillips Pet. Co., Lima, 23-7n-6e	30,000	.....
Phillips Pet. Co., Oklahoma City, 1-11n-3w	200,000	.....
Phillips Pet. Co., Reserve, 16-24n-7e	35,000	.....
Phillips Pet. Co., Wetumka, 3-9n-9e	20,000	.....
Phillips Pet. Co., Wewoka, 33-8n-8e	30,000	.....
Pioneer Corp., Bixby	2,000	.....
Powers, M. F., Depew, 8-15n-8e	3,000	500
Producers Pipe & Supply Co., Slick	1,500	.....
Pure Oil Co., Drumright	10,000	.....
Pure Oil Co., Seminole	20,000	2,000
Reed & Swab, Wewoka, Cromwell	3,500	.....
Shell Oil Co., Inc., Okemah, NW 35-11n-8e	25,000	.....
Shell Oil Co., Inc., Orlando,‡ 17-20n-2w	36,000	8,000
Shell Oil Co., Inc., Okemah, 32-15n-7e	3,000	.....
Shell Oil Co., Inc., Tonkawa,† 21-29n-1w	6,000	.....

OKLAHOMA (Continued)

Company, mailing address, plant location—	Daily cap. (gal.)	Dly L.P.G. cap. (gal.)
Shell Oil Co., Inc., Tonkawa,† 2-24n-1w	10,000	.....
Shell Oil Co., Inc., Wilson, 8-4s-3w	12,000	.....
Shell Oil Co., Inc., Wilson,* 22-4s-2w	16,000	.....
Shell Oil Co., Inc., Wolco, 24-24n-11e	10,000	.....
Sinclair Prairie Oil Co., Covington	15,000	2,000
Sinclair Prairie Oil Co., Drumright	25,000	.....
Sinclair Prairie Oil Co., Shamrock	16,500	.....
Sinclair Prairie Oil Co., St. Louis	80,000	.....
Sinclair Prairie Oil Co., Seminole, 35-9n-6e	50,000	.....
Sinclair Prairie Oil Co., Seminole, 10-8n-6e	50,000	42,600
Skelly Oil Co., Fairfax No. 1-2, 10-25n-6e	§70,000	.....
Skelly Oil Co., Lyman, 23-27n-5e	15,000	50,000
Skelly Oil Co., Naphtha No. 102, 9-26n-6e	§50,000	.....
Skelly Oil Co., Wynona, 24-24n-9e	3,000	.....
Texas Co., Blackbird, Osage County	4,200	.....
Texas Co., Davenport, Lincoln County	12,000	.....
Texas Co., Z. Moore, Creek County	13,500	.....
Tide Water Assoc. Oil Co., Creek County	1,000	.....
Victor Gasoline Co., Bristow, 27-16n-9e	4,000	400
Victor Gasoline Co., Stroud, 1-15n-6e	2,500	250
Warren Pet. Corp., Aylesworth, Marshall Co.	25,000	24,000
Warren Pet. Corp., Graham, Carter County	15,000	5,000
Warren Pet. Corp., Maud, Pottawatomie Co.	30,000	15,000
Warren Pet. Corp., Madill	14,000	21,000
Westoak Gasoline Co., Sayre	10,000	3,000
Wright, Rosa B, Kellyville	5,000	.....
Yale Gasoline Co., 13-19n-5e	1,500	.....
Total	1,850,200	248,950

*Partnership with Carter Oil Co. †Partnership with Continental Oil Co. ‡Partnership with seven companies. §Raw make processed at the Lyman plant.

PENNSYLVANIA

Alum Rock Gas Co., Port Allegany, Fern	500	.....
Bayliss & Bayliss, Titusville	10,000	.....
Carpenter, M. A., Karns City	200	.....
Carnegie Natural Gas Co., Lone Pine, Washington County	1,000	.....
Clinger Oil & Gas Co., Tidioute, Fagundus	1,000	.....
Clinger Oil & Gas Co., Tidioute, Hastings	1,000	.....
Cochran, John G., & Co., Sheffield	*1,100	.....
Columbia Gas & Electric Corp., Kane	*7,000	.....
Columbia Gas & Electric Corp., W. Finley	5,000	.....
Columbia Gas & Electric Corp., Majorsville, W. Va.	10,000	.....
Columbia Gas & Electric Corp., Waynesburg	*10,000	.....
Cook Oil Lease, Mayburg	150	.....
Crawford & Gregory, Emlenton, Fryburg	500	.....
Dempseytown Gas Co., Port Allegany, Clarion County	1,000	.....
Edwards, E. A., Titusville	170	.....
Ellenburger, W. J., & Sons, Karns City	300	.....
Elliott Brothers, Chicora	500	.....
Equitable Gas Co., Clarksburg, Washington Co.	2,000	.....
Equitable Gas Co., Rogersville, Greene County	10,000	.....
Fleming, J. E., Grand Valley	100	.....
Forest Chemical Co., Sheffield	*300	.....
Harvey, John J., estate, Titusville, Pleasantville	500	.....
Haskell, Roth & Bayliss, Tidioute, Warren Co.	10,000	.....
Hickey & Russell, Henry's Mills	300	.....
Hope Const. & Ref. Co., Brave, Appalachian	25,000	.....
Hope Const. & Ref. Co., Imperial, Appalachian	3,600	.....
Jennings, E. H., Bros. Co., Pittsburgh, Oakdale (3 plants)	1,500	.....
Kapp & Brochlehurst, Tidioute	100	.....
Mars Co., Hickory plant, Forest County	*1,500	.....
Mars Co., Lewis Run	6,500	.....
Mars Co., Miola, Clarion County	*1,800	.....
Mars Co., Pinegrove, Venango County	4,000	.....
Mars Co., Van	7,500	2,000
Moore, Way & Harrison, Titusville	100	.....
Pennsylvania Oil Co., Sheffield, Warren Co.	10,000	.....
Pittsburgh Oil & Gas Co., Pittsburgh, Clarion	150	.....
Pittsburgh Oil & Gas Co., Pittsburgh, Miola	150	.....
Red Brush Oil Co., Tidioute, near Tionesta	300	.....
Sand Hill Lease, Tidioute	100	.....
Sloan & Zook Co., Kane	1,000	950
South Penn Oil Co., Pittsburgh, Kane	100	.....
President	500	.....
South Heights	550	.....
Bradford	550	.....
Chicora	150	.....
Parker	100	.....
New Freeport	1,000	.....
Guffey	*150	.....
Washington	100	.....
Taylorstown	100	.....
Evans City	150	.....
Pleasantville	300	.....
Porcupine	650	.....
Pleasantville	*100	.....

PENNSYLVANIA (Continued)

Company, mailing address, plant location—	Daily cap. (gal.)	Dly L.P.G. cap. (gal.)
Sturgeon	1,500	.....
Tiona	450	.....
Henry's Mills	300	.....
Hooker	100	.....
Noblestown (2)	1,725	.....
Surety Oil Co., Titusville	1,000	.....
Thomas, R. L., Tidioute, Middle field	150	.....
Tompsett Bros., Tidioute	200	.....
Triangle Co., Coraopolis	100	1,600
Triumph Pet. Co., Tidioute	150	.....
Wahl, A. R., Evans City, Butler	150	.....
Warner-Caldwell Oil Co., Titusville	1,000	.....
Total	147,245	4,550

*Shut down.

TEXAS

Abercrombie Co., J. S., Sweeney, Old Ocean	75,000	36,000
Agua Dulce Co., Robstown, Banquette	45,000	.....
American Republics Corp., Houston, Joe's Lake	8,000	.....
Anzac Oil Corp., Coleman County Overall field	500	.....
Arkansas Fuel Oil Co., Jefferson, Marion Co.	38,000	1,200
Arkansas Fuel Oil Co., Jefferson, Marion Co.	*11,000	.....
Arkansas Fuel Oil Co., Longview, Marion Co.	40,000	.....
Arkansas Fuel Oil Co., Waskom, Harrison Co.	24,000	.....
B-W Gasoline Co., Angleton	*10,000	5,000
Bell Oil & Gas Co., Burkburnett	5,000	.....
Barnsdall Oil Co., Odessa, 18-42-2s	25,000	6,000
Big Lake Oil Co., Texon 2-2, Reagan County	50,000	.....
Cabot Carbon Co., Wickett, Estes field	20,000	7,000
Cabot Carbon Co., Kermit, Keystone field	30,000	.....
Cabot Carbon Co., Kermit	45,000	.....
Canadian River Gas Co., Channing, Moore Co.	30,000	.....
Cannon Gasoline Co., Amarillo	6,000	1,000
Cities Service Oil Co., Odessa, Ector County	35,000	.....
Cities Service Oil Co., Pampa, Gray County	30,000	.....
Clymore Co., Inc., Refugio	30,000	2,000
Coltexo Corp., Lefors, Gray County	40,000	.....
Columbian Gasoline Corp., Shamrock, Wheeler County	12,000	.....
Consolidated Gasoline Co., Eastland	4,000	.....
Continental Oil Co., Electra (3), Wichita Co.	70,000	40,000
Danciger Oil & Ref. Co., Brazoria County	40,000	6,000
Danciger Oil & Ref. Co., Lefors	20,000	.....
Deep Oil Development Co., Wichita Falls, Archer City	4,000	.....
Deep Oil Development Co., Wichita Falls, Kamay	4,800	.....
Del Ray Pet. Co., Hardin	10,000	5,000
Desdemona Gasoline Co., Desdemona	3,000	.....
Duval Gasoline Co., Benavides	16,000	4,000
General American P. L. Co., Dallas, Gladewater	30,000	.....
Gregg-Tex Gasoline Corp., Longview	150,000	85,000
Gulf Ref. Co., Monahans, Ward	30,000	.....
Gulf Ref. Co., Overton	15,000	.....
Hagy, Harrington & Marsh, White Deer, Carson-Gray counties	75,000	50,000
Hamman Exploration Co., Bay City, Hamman field	12,600	3,000
Hanlon Gasoline Co., Breckenridge	50,000	.....
Hanlon Gasoline Corp. of Texas, Gladewater	150,000	.....
Harper Trust Co., Bryson, Jack County	1,000	.....
Frank C. Henderson Trust No. 2, Sanford, Panhandle field	40,000	.....
Hercules Gasoline Co., Inc., Kilgore	55,000	45,000
Highlander Gasoline Co., Nocona, Rogers	2,000	.....
Huber, J. M., Corp., Borger, Borger	30,000	.....
Humble Oil & Ref. Co., Bloomington, Heyser	11,000	.....
Humble Oil & Ref. Co., Conroe	18,000	.....
Humble Oil & Ref. Co., Corpus Christi, Flour Bluff	14,000	.....
Humble Oil & Ref. Co., Dickinson	11,000	.....
Humble Oil & Ref. Co., Overton	31,000	.....
Humble Oil & Ref. Co., Overton, Kilgore	26,000	.....
Humble Oil & Ref. Co., Overton	40,000	68,000
Humble Oil & Ref. Co., Tomball	22,000	.....
Knox Ref. Co., Knox, Graham	2,500	.....
Lesh & McCall, Wichita Falls, Nacona	5,000	.....
Lisbon Gasoline Co., Henderson, Rusk County	50,000	.....
Lone Star Cos Co., Gordon	15,000	3,000
Lone Star Gas Co., Petrolia	5,000	.....
Lone Star Gas Co., Pueblo, Moran	5,000	.....
Lone Star Gas Co., Sipe Springs, near Rising Star	1,000	.....
Lone Star Gas Co., Trinidad	30,000	.....
Lone Star Producing Co., Brooks, Breckenridge	30,000	.....
Lone Star Producing Co., Ranger (2)	30,000	40,000
Magnolia Pet. Co., Burkburnett, Wichita Co.	4,000	.....
Magnolia Pet. Co., Desdemona, Eastland Co.	7,500	.....
Magnolia Pet. Co., Electra, Wilbarger County	4,500	.....
Magnolia Pet. Co., Kermit, Winkler County	18,000	.....
Magnolia Pet. Co., Kings Mill, Gray County	9,000	.....

TEXAS (Continued)

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Magnolia Pet. Co., Olden, Eastland County	9,000	.....
Magnolia Pet. Co., Sunray, Moore County	20,000	.....
Manhattan Gasoline Co., Sinton	25,000	.....
Mid-Co Gasoline Corp., Corsicana, Cayuga	10,000	.....
Midland Gasoline Co., Conroe	30,000	20,000
Nash Gasoline Co., Graham, James field	5,000	5,000
Natural Gasoline Corp., Aransas Pass, McCampbell	10,000	3,000
Nine Oaks Gasoline Corp., Gladewater	700	.....
Novice Gas Recycling Corp., Eastland, Novice	3,000	.....
Parade Co., The, Overton, Joiner	125,000	50,000
Phillips Pet. Co., Bowers, Gray County	50,000	.....
Phillips Pet. Co., Canadian, Hutchinson Co.	20,000	.....
Phillips Pet. Co., Carson, Carson County	20,000	.....
Phillips Pet. Co., Crane, Crane County	30,000	.....
Phillips Pet. Co., Eliasville, Stephens County	12,000	.....
Phillips Pet. Co., Frankell, Stephens County	8,500	.....
Phillips Pet. Co., Goldsmith, Ector County	60,000	.....
Phillips Pet. Co., Gray, Gray County	100,000	.....
Phillips Pet. Co., Ibex, Shackelford County	12,000	.....
Phillips Pet. Co., Johnson, Hutchinson Co.	50,000	.....
Phillips Pet. Co., Judkins, Ector County	40,000	.....
Phillips Pet. Co., Lefors, Gray County	15,000	.....
Phillips Pet. Co., Lodi, Cass County	40,000	.....
Phillips Pet. Co., Mankins, Wichita County	35,000	.....
Phillips Pet. Co., North, Gray County	50,000	.....
Phillips Pet. Co., Pampa, Gray County	60,000	.....
Phillips Pet. Co., Panhandle, Carson County	15,000	.....
Phillips Pet. Co., Pantex, Hutchinson County	50,000	.....
Phillips Pet. Co., Pioneer, Eastland County	15,000	.....
Phillips Pet. Co., Ray, Moore County	10,000	.....
Phillips Pet. Co., Rock Creek, Hutchinson Co.	60,000	.....
Phillips Pet. Co., Sanford, Hutchinson County	40,000	.....
Phillips Pet. Co., South Bend, Young County	9,000	.....
Phillips Pet. Co., Texroy, Hutchinson County	50,000	.....
Portland Gasoline Co., Pampa	30,000	.....
Pure Oil Co., Van	45,000	5,000
Rhodes Pool Gasoline Co., Bryson	2,000	.....
Roeser & Pendleton, Inc., Albany, Bluff Creek	30,000	.....
Roeser & Pendleton, Inc., Albany, Cook field	1,500	.....
Rudco Oil & Gas Co., Desdemona	5,000	.....
Rudco Oil & Gas Co., Rising Star	5,000	1,500
Sabine Valley Gasoline Co., Longview	57,000	90,000
Shamrock Oil & Gas Corp., Sunray	15,000	.....
Shell Oil Co., Inc., Denver City,‡ Yoakum Co.	60,000	.....
Shell Oil Co., Inc., Pampa, Gray County	5,000	.....
Shell Oil Co., Inc., Skellytown, Carson County	25,000	.....
Shell Oil Co., Inc., Skellytown, Carson County	80,000	35,000
Sinclair Prairie Oil Co., Longview	80,000	35,000
Sinclair Prairie Oil Co., Taft	15,000	31,000
Sinclair Prairie Oil Co., Troup	80,000	.....
Skelly Oil Co., Armstrong, Hutchinson Co.	15,000	5,000
Skelly Oil Co., Burkburnett	10,000	1,000
Skelly Oil Co., Crawford, Carson County	‡30,000	.....
Skelly Oil Co., Kings Mill, Gray County	‡32,000	.....
Skelly Oil Co., Shafer No. 1	34,000	50,000
Skelly Oil Co., Watkins, Hutchinson County	‡22,000	.....
Smith Brothers Refinery Co., Inc., Magic City	15,000	.....
Smith Brothers Refinery Co., Inc., McLean	40,000	.....
Southern Coast Corp., Corpus Christi	6,000	.....
Southern Minerals Corp., Corpus Christi, Saxet	60,000	.....
Standard Oil Co. of Texas, Royalty, Ward Co.	20,400	.....
Stanolind Oil & Gas Co., Bishop, Luby	30,000	2,500
St. Marys Oil & Gas Co., Moran, Callahan Co.	750	.....
Texas Co., Burkburnett, Wichita County	13,500	.....
Texas Co., Electra, Wichita County	19,000	.....
Texas Co., Johnson, Foard County	6,500	.....
Texas Pacific Coal & Oil Co., Caddo	15,000	8,000
Texas Pacific Coal & Oil Co., Eliasville	10,000	1,500
Texas Pacific Coal & Oil Co., Strawn	10,000	.....
Texoma Natural Gas Co., Fritch, Hutchinson County	85,000	.....
Texoma Natural Gas Co., Stinnett†, Moore Co.	18,000	.....
Tucker Oil Co., Wichita Falls, Wichita County	2,000	.....
United Gas Pipe Line Co., Banquette, Agua Dulce	45,000	.....
United Gas Pipe Line Co., Refugio	25,000	.....
Waggoner, W. T., Estate, Vernon	7,000	.....
Warren Pet. Corp., Fairbanks, Harris County	15,000	10,000
West Texas Gas Co., Fritch	15,000	.....
Woodley Pet. Co., Baird, Callahan County	900	.....
Total	4,074,150	762,200

*Shut down.
†Coltexo Corp. owns half interest.
‡Raw-make processed at Schafer plant.

WEST VIRGINIA

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Blue Creek Oil & Gas Co., Charleston, Blue Creek	*3,500	.....
Carbide & Carbon Chemicals Corp., Diamond	3,000	.....
Carbide & Carbon Chemicals Corp., Hastings	2,000	.....
Carnegie Natural Gas Co., Hundred	3,300	.....

WEST VIRGINIA (Continued)

Company, mailing address, plant location—	Daily cap. (gal.)	Dly.L.P.G. cap. (gal.)
Carnegie Natural Gas Co., Underwood	3,000	.....
Carnegie Natural Gas Co., Pine Grove	*3,000	.....
Carnegie Natural Gas Co., Toll Gate	100	.....
Dinsmoor & Co., St. Marys, Sugar Creek, Shawnee, Henry Camp, Bills 10-Acre, Fetty, Roby, Brush Run and Pike plants	290	.....
Dun Mar Oil & Gas Co., Fairview, Jarke Run	400	.....
Falling Rock Cannel Coal Co., Falling Rock	3,000	.....
Hapgood, Roswell T., & Co., Cedar Grove	6,500	.....
Henaghan & Hanlon, Inc., Sistersville, Big Knot	1,000	.....
Burns	800	.....
Hammee	2,000	.....
Harrisville	500	.....
Highland	800	.....
Murphy	300	.....
Nye	1,500	.....
Rock Run	600	.....
Hope Const. & Ref. Co., Bristol, Appalachian	8,000	.....
Cornwell, Appalachian	14,000	.....
Mount Clair, Appalachian	2,500	.....
Pine Grove, Appalachian	40,000	30,000
Valley Chapel, Appalachian	20,000	.....
Waverly, Appalachian	5,000	.....
Jennings, E. H., Bros. Co., Pittsburgh, Pa., Jacksonburg (2)	1,500	.....
Melrose Oil & Gas Co., Sistersville, Middlebourne	100	.....
Oil & Gas Co., Parkersburg, Ritchie County	250	.....
Owens, Libby-Owens Gas Dept., South Malden	10,000	10,000
Pittsburgh Oil & Gas Co., Macfarlan, Ritchie County	200	.....
Pittsburgh Oil & Gas Co., Middlebourne, Tyler County	50	.....
Pure Oil Co., Dawes	12,000	3,000
Reno Oil Co., Hannahdale, Ritchie County	46	.....
Harrisville, Ritchie County	81	.....
Middlebourne, Tyler County (3) 125	27	.....
Sistersville, Tyler County	33	.....
South Penn Oil Co., Pittsburgh, Pa., Coco	2,200	.....
Glenville	1,100	.....
Liverpool	1,000	.....
Mannington	1,500	.....
Bula	200	.....
Aloy	1,400	.....
Bulls Mills	700	.....
Spencer	2,600	.....
Walton	2,400	.....
Fink	1,000	.....
Yawkey	3,000	.....
Macfarlan	2,000	.....
Wolf Summit	2,000	.....
Metz	1,500	.....
Smithfield	3,000	.....
Statler Run	2,200	.....
Pine Grove	2,500	.....
Ashley	250	.....
Clay Court House	2,200	.....
Shirley (2)	1,600	.....
Shinnston	400	.....
Blue Creek (2)	*4,700	.....
Tyler Oil Co., Sistersville, Tyler County (3)	110	.....
Union Gasoline & Oil Corp., Moundsville, Marshall County	3,000	.....
Jane Lew, Lewis County	3,000	.....
Porters Falls, Wetzel County	10,000	.....
Virginian Gasoline & Oil Co., Charleston, Kanawha County	*2,000	.....
Charleston, Kanawha County	15,000	.....
Clendenin, Kanawha County	40,000	6,000
Hubball, Lincoln County	12,000	.....
Jarretts Fords, Kanawha County	1,800	.....
Mammoth, Kanawha County	2,500	.....
Ona, Cabell County	18,000	.....
St. Albans, Kanawha County	3,500	.....
Sandyville, Jackson County	20,000	14,000
Spencer, Roane County	*12,000	.....
Three Mile, Kanawha County	3,500	.....
Walgrove, Kanawha County	*1,000	.....
Total	336,344	63,000

*Shut down.

WYOMING

Continental Oil Co., Lance Creek, 31-36n-65w	25,000	15,000
Northern Utilities Co., Riverton	4,500	.....
Ohio Oil Co., Grass Creek, Hot Springs County	3,600	.....
Ohio Oil Co., Rocky River, Carbon County	5,000	.....
Ohio Oil Co., Rock River, Carbon County	5,000	2,000
Sinclair Wyoming Oil Co., Lost Soldier, 10-26n-90w	5,000	.....
Stanolind Oil & Gas Co., Midwest, Salt Creek	70,000	.....
Total	118,100	17,000

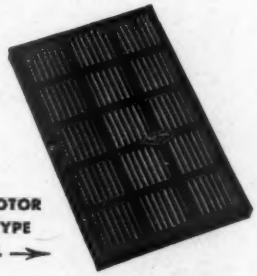
THROUGHOUT American industry, Staynew Filters increase production, reduce maintenance. More guns, planes, tanks, ships, shells, trucks, and war materials of every kind are produced and moved faster to the fighting fronts because Staynew Filters are on the job.

At the fighting fronts, Staynew Filters add to the deadly efficiency of American weapons. Many a U. S. fighting man today owes his very life to the greater fire-power, speed, efficiency, or reliability of Staynew-equipped instruments of war.

After Victory, Staynew Filters will again help peacetime industry produce better, cheaper, faster.

Partial List of Staynew Filters and Their Direct Application to America's War Effort

STAYNEW INTAKE FILTERS help maintain maximum performance of tank, truck, and marine engines by preventing the intake of abrasive dust.



PROTECTOMOTOR AIRCRAFT-TYPE FILTER CELL →

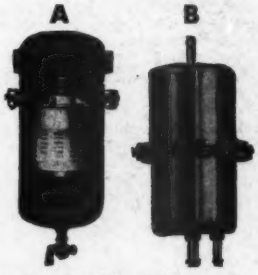
CIRCULAR TYPE AIR INTAKE FILTER

STAYNEW INTAKE FILTERS (Aircraft-type) help maintain a sufficient supply of clean air to aircraft carburetors and engines.

MODEL CPHLS LIQUID LINE FILTER

STAYNEW LIQUID LINE FILTERS add to long life and reliability of internal combustion engines for airplanes, tanks, trucks, and naval vessels by removal of gritty particles and carbon from fuel and lubricating oils. These filters speed war production by removing foreign matter from coolant oils; they guarantee clean water in the field for photo-processing; they are capable of handling algae-bearing water.

STAYNEW OIL VAPOR ARRESTORS prevent oil from crankcase breathers reaching blades of engine turbo-chargers; also prevent oil from the discharge of rotary or other types of compressors damaging or fouling accessory apparatus and control mechanisms.



A—Model CPH Oil Vapor Arrestor

B—Model CP Aircraft-type Oil Vapor Arrestor.

Automatic Type Ventilation Filter

STAYNEW FILTERS for building ventilation, including automatic and dry panel types, are contributing everywhere to the continuity of service of both men and machines.

BUILDING AIR-SUPPLY FILTER

Have You A Filter Problem?

The broad experience of Staynew engineers is proving invaluable in solving war industry problems. This experience, product of more than 22 years of exclusive filter manufacturing, is yours for the asking.

OVER ONE MILLION STAYNEW FILTERS PLACED IN SERVICE

STAYNEW FILTER CORP.

PROTECTOMOTOR AIR FILTERS

"Filter Headquarters"

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Condensate-Recovery Operations Continue Expansion Under Handicap

EXPANSION of high-pressure condensate-recovery operations continued this year despite limitations on critical materials, transportation shortages and a general contraction of civilian motor-fuel consumption. The country now has 34 plants capable of handling 2,204,000,000 cu. ft. of gas per day, according to The Journal's annual survey.

Daily production of condensate-recovery plants, several of which are tied primarily into pressure-maintenance operations, averages 66,550 bbl. Condensate recovery averages 36,230 bbl. daily; motor fuel, 12,895; butane-propane, 9,375 and other products 8,050 bbl. per day.

Texas, with a current total of 29 condensate-recovery plants, is by all odds the outstanding center of such operations. Most of the plants are in two general locations, East Texas and the Gulf Coast, although one of the largest operations is at Cotton Valley, Webster Parish, Louisiana. The general trend in condensate-recovery operations closely follows the pattern in natural-gasoline manufacture in that both branches of the industry are constantly improving fractionation equipment and thus enhancing the value of production.

Fifteen of the country's 34 condensate-recovery plants are qualified to recover butane and propane in various degrees of purity and in various percentages of the total output.

In the larger cycling plants where substantial reserves are available, additional importance is being given and will continue in the postwar period to the installation of complete refinery equipment so that the lighter hydrocarbons may be utilized at the point of production. The transportation of butane and propane is a costly factor which invites the installation of equipment near the point of production for the sake of economy.

There is a distinct probability that the larger plants will also sustain chemicals and chemical manufacturing from the raw materials, inherently available in condensate operations, from the raw material to such products as plastics, rubber and other synthetic organic compounds. The current concentration of large condensate-recovery plants in two main areas also indicates to some observers that the opportunities are particularly inviting for installation of central stabilizer stations which may draw materials from several plants, when distance permits. The central stabilizer stations may be employed to segregate various components.

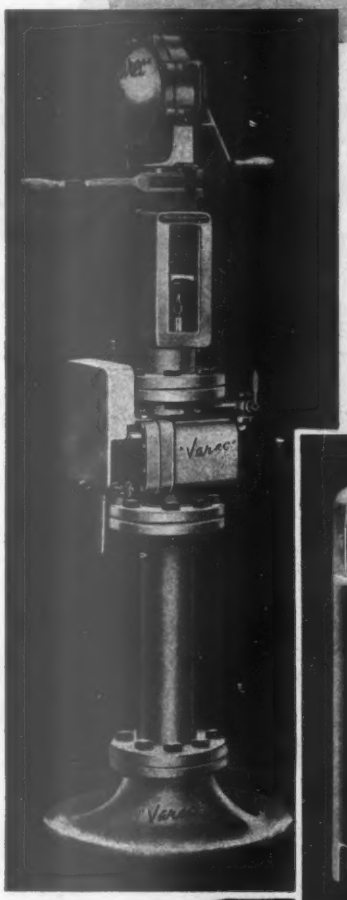
SUMMARY OF CONDENSATE-RECOVERY PLANTS IN UNITED STATES

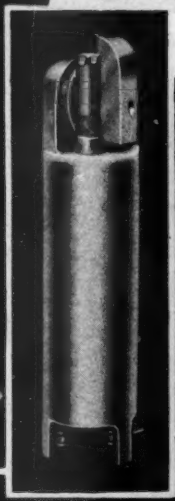
	No. of plants		Dly. gas cap., M.c.f.	
	1943	1942	1942	1941
Louisiana	4	4	205,000	190,000
New Mexico	1	0	4,000	.....
Texas	29	27	1,995,000	1,820,000
Total	34	31	2,204,000	2,010,000

SURVEY OF CONDENSATE-RECOVERY OPERATIONS

Company, plant address, and field location—	Daily gas capacity (M.c.f.)	Daily production in barrels—Condensate	Motor fuel	Butane-propane	Other products
LOUISIANA					
Cotton Valley Operators Committee, Cotton Valley; Cotton Valley, Webster Parish	150,000	8,500	.....	2,500	.....
Stanolind Oil & Gas Co., Jennings; South Jennings, Acadia Parish	55,000	.....	700	.....	325
Texas Co., New Orleans; Berwick, St. Mary Parish	.....	.....	.....	.....	.....
Texas Co., New Orleans; Mongoulois, St. Mary Parish	.....	.....	.....	.....	.....
NEW MEXICO					
Loco Hills Pressure Maintenance Association; Loco Hills	4,000	500	.....	.....	.....
TEXAS					
Abercrombie, J. S., Co., and Harrison Oil Co., Houston; Old Ocean, Brazoria County	200,000	.....	.....	.....	.....
Agua Dulce Co., The, Robstown; Banquete, Nueces County	60,000	1,075	.....	.....	.....
American Liberty Oil Co., Blessing; Blessing field, Matagorda County	28,000	650	.....	.....	.....
American Liberty Oil Co., Grapeland; Grapeland field, Matagorda County	55,000	1,500	.....	.....	.....
Anco Gas Corp., Palestine; Long Lake field, Anderson County	50,000	1,300	.....	.....	.....
Chicago Corp., Bishop; Stratton field, Nueces County	120,000	1,500	1,000	720	650
Chicago Corp., Robstown; Agua Dulce field, Nueces County	120,000	1,450	1,100	720	600
Davis, W. R., Co., Alice; East Alice field, Jim Wells County	100,000	1,700	.....	100	.....
Distillate Products Corp., Houston; North Houston	55,000	.....	.....	625	1,100
Francitas Gas Co., Blessing; Francitas, Jackson County	60,000	2,500	.....	.....	.....
Gasoline Production Corp., Grapeland; Grapeland field, Houston County	60,000	2,000	.....	.....	80
Geier-Jackson Recycling Co., Grapeland; Grapeland field, Houston County	48,000	.....	1,240	360	60
Gulf Plain Corp., Bishop; Agua Dulce, Nueces County	125,000	1,650	1,000	730	620
Harrel, H. M., Shreveport; Bammel field, Harris County	35,000	900	.....	.....	.....
Hunt Oil Co., Palestine; Long Lake field, Anderson County	50,000	.....	760	270	.....
Killam, O. W., Route 8, Houston; Harris County	20,000	200	.....	.....	110
Lockhart Oil Co. of Texas, Banquete; Agua Dulce field, Nueces County	50,000	1,335	1,095	1,190	1,190
La Gloria Corp., Falfurrias; Falfurrias, Jim Wells County	225,000	.....	4,200	800	600
Lone Star Producing Co., Grapeland; Grapeland, Houston County	80,000	.....	1,800	675	1,925
Lone Star Producing Co., Longview; Longview, Gregg County	50,000	650	.....	65	.....
Lone Star Producing Co., Murchison; Opelika field, Henderson County	90,000	4,500	.....	450	.....
Roeser & Pendleton, Inc., Route 2, Malakoff; Cayuga field, Anderson County	8,000	75	.....	.....	.....
Skinner & Eddy Corp., Corpus Christi; Alice	90,000	450	.....	100	.....
Stanolind Oil & Gas Co., Woodsboro; La Rosa	50,000	190	.....	60	350
Sun Oil Co., Beaumont; Seabreeze, Chambers County	18,000	.....	.....	.....	.....
Trinity Gas Corp., Dallas; Long Lake field, Anderson County	20,000	430	.....	.....	.....
Tide Water Associated and Seaboard, Palestine; Cayuga No. 1, Anderson County	28,000	800	.....	.....	.....
Tide Water Associated and Seaboard, Palestine; Cayuga No. 2, Anderson County	40,000	950	.....	.....	.....
Tide Water Associated and Seaboard, Palestine; Long Lake field, Anderson County	60,000	1,425	.....	.....	.....

SPECIFY "VAREC" FOR ACCURATE SAMPLING, GAUGING AND VENTING PRESSURE TANKS





THE "VAREC" approved Gastight Gauging and Sampling Unit takes accurate gauges, temperatures, and spot or running samples without loss of tank pressure. In serving a group of tanks, a worthwhile economy is effected by substituting a "blind head" for each tank. The noncorrosive Sampling and Temperature Bomb is extremely simple in operation—a slight jerk on the tape will close it or open it as desired.

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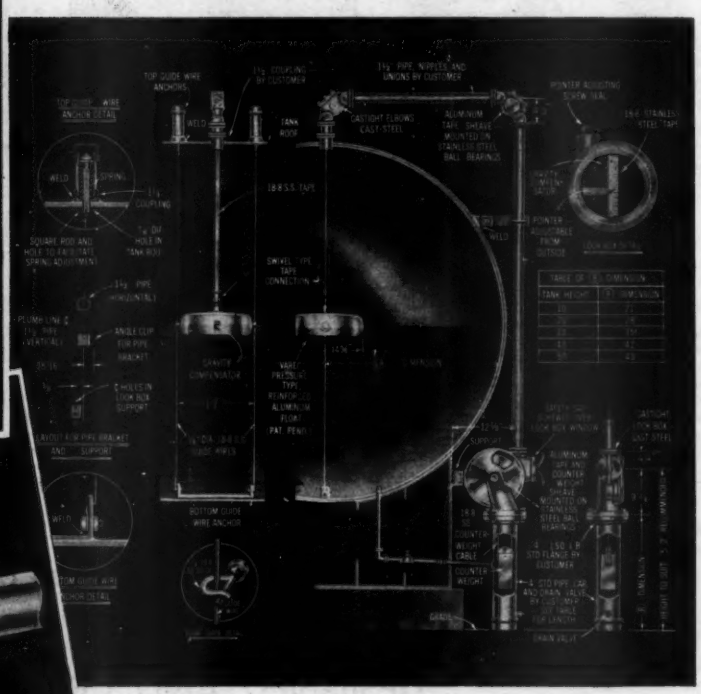
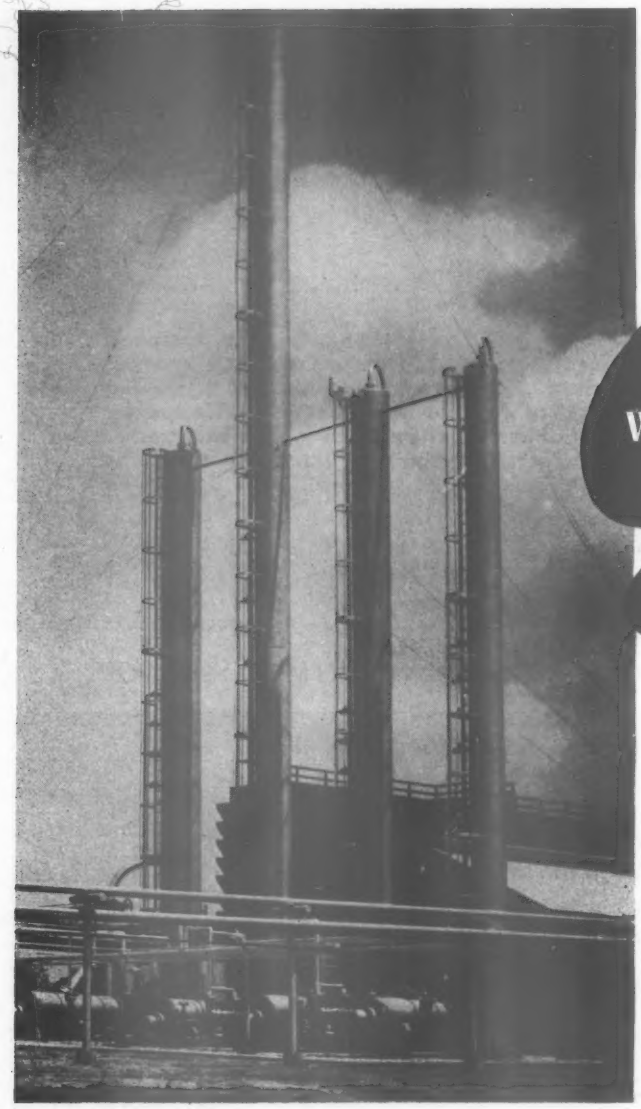


"VAREC" approved High-Pressure Gastight Automatic Tank Gauge is accurate to 1/16 of an inch. Adaptable to any type or size of tank, it is noncorrosive throughout.

This noncorrosive Pressure and Vacuum Relief Unit is installed on high pressure tanks and can vent either to atmosphere or to a vapor collecting system.

SEND FOR THE *New* "VAREC" CATALOG P-7



Fractionating Columns
Warren Petroleum Corporation
Madill, Oklahoma Plant

This is one of several plants having multiple column fractionating equipment which includes de-ethanizers, de-propanizers, de-butanizers, de-isobutanizers, and de-isopentanizers,

DESIGNED AND CONSTRUCTED BY

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713 Second National Bank Building
HOUSTON, TEXAS

All Vital Drilling Functions Are Recorded by New Instrument

by Harry F. Simons

Here is described an instrument which automatically records all of the functions of the rig on an easily read strip chart and which provides the driller with the necessary information. It is really a combination of individual instruments developed for recording the separate functions.

THE main objective of a driller and his crew is to drill a well as rapidly as possible with a minimum use of material. The other duties, such as the installation, operation and maintenance of the equipment and the supervision of the roughnecks are merely incidental to this objective. The principal factors (excepting mud treatment) in accomplishing fast and safe drilling of the hole are the selection of the type of bit, rotary speed and weight which give the best results and replacement of the bit at the proper time.

In the final analysis, these will always depend on the judgment of the driller. Selection of the bit depends on the condition of the bit just pulled from the hole plus the driller's knowledge of the formations immediately ahead. The rotary speed and weight used while drilling may be based on the knowledge of the particular formation being drilled and the peculiarities and action of the bit. "Run 'er where she drills the best" is more than an idle phrase. Selection of the time to pull the bit is likewise based on the knowledge of the formations already penetrated, the history of the operation of the bit, plus its behavior.

Sound judgment can only be based on the facts available to the one deciding a particular question or solving a particular problem. The more information the driller has, the easier it is for him to decide. Relying on memory or on written records of the previous operation or operations in the same field is unsatisfactory for obvious reasons. Memory is a capricious faculty and cannot be relied on for accurate details. A written record prepared by the driller or some member of the crew likewise lacks the necessary detail and the keeping of such a record is extremely burdensome on the personnel. Consequently, if the driller is to have the necessary data on which to base his judgment, they must be recorded automatically.

At the present time there is a commercial instrument on the market (Drillogger) which automatically records all of the functions of the rig on an easily read strip chart and which provides the driller with the necessary information. This instrument records the weight on the bit, the rotary speed, the torque, the pressure of the drilling fluid (more commonly known as mud pressure), and the rate of penetration.

The present instrument is a combination of individual instruments developed for recording the separate functions placed together so that a single record including all the information could be obtained. A brief review of the history of these instruments and their separate application is useful in estimating the value of the combination and the record thus obtained.

Weight Indicator: This is the oldest instrument with the exception of the steam gage used on a drilling rig. Essentially it records the strain on the deadline which in turn indicates the load on the hook and consequently the load on the bit. In drilling it is possible to keep an even load on the bit by slacking off or holding up on the brake and thus maintaining the hand on the indicator at a set value. The weight indicator also tells when the drill stem has parted by showing a loss in the load on the hook. In fishing it tells when the fish has been contacted, when the fishing tool has passed over the fish, and when the fish is picked up. When pulling on pipe it shows accurately the load being imposed on the derrick and the strain on the drill stem. It is also essential for running special tools. First indicators were graduated in points, necessitating reference to calibration tables for conversion into tons but recent advanced models use smaller weight divisions (1,000 lb. direct reading) plus a vernier hand which can be adjusted to read in very small increments. Original recording was on a polar chart but in the present Drillogger assembly it is on a strip chart.

Rotary Speed: This is measured by a tachometer, an instrument which has been in use in other industries for a number of years but which is still not widely used by the drilling industry. It records the revolutions per minute of the shaft on the rotary table. If one wants to determine the need for such an instrument he has but to ask a driller how fast he is rotating and then check his answer by clocking the revolutions with a stop watch. A few drillers are surprisingly accurate while others are generally off 20 per cent and frequently as much as 50 per cent. Consequently, the notation on the drilling report of 100 r.p.m. probably means somewhere between 90 and 130 r.p.m.

Instrument located immediately in front of driller's position at brake handle

Mud Pressure: Instrument for recording this value is next oldest to the weight indicator. Essentially it is a diaphragm installed on the blind end of a connection in the mud line, the fluid pressure being transferred through a tube to the indicating gage. It shows fluctuations in pressure being delivered by the pump. A rise in pressure shows either partial stoppage of the system or a loading of the mud stream in the annulus. A drop in pressure may indicate a faulty pump, a leak in the drill pipe, a break in the drill pipe or a lightening of the mud in the annulus between drill pipe and hole.

Torque: Instruments for measuring torque on the drill stem first came into use a little over 10 years ago but this instrument is still not standard equipment on a rig. Torque measurements are obtained through special gages connected to the intake manifold of the steam engine (pressure gage) or gas, gasoline, and octane engine (vacuum gage). There is no simple torque gage available for diesel engines because of the solid fuel injection systems.

Torque gage readings are relative but are valuable as they show changes in horsepower required to turn the drill stem and give a good indication of the formation being drilled and the condition of the bit. The manifold pressure readings can be used along with other data to determine horsepower at any particular instant or under any given set of conditions. Ordinarily this is done only for experimental or research purposes.

Drillers use the torque gage in the same manner they formerly employed with the older weight indicators. By comparing current readings with those observed and logged in the immediate past, conditions such as dulled or balled up bits, increasing friction due to crooked holes, and changes in torque due to increasing or decreasing speed or weight are clearly revealed.

Rate of Penetration Recorder: This is a modern innovation which first was introduced about 5 years ago and the potentialities of which are still not realized. The position of the top of the kelly is recorded continuously and consequently the progress of drilling. Rate of penetration is recorded in the footage made in each 15-minute period and may be converted to feet per hour by multiplying by four, into feet per minute by dividing by 15, or into minutes per foot by dividing 15 minutes by the footage made during a period. However, on the chart time is recorded vertically and depth horizontally so that a reduction in the rate of penetration increases the slope of the line while an increase in penetration causes the line to approach the horizontal, or flatten out. As the driller is mainly interested in cutting rate changes and in comparative cutting rates, the conversion to feet per minute, etc., is not generally necessary. In case it is desired to determine the cutting rate of any particular formation or at any particular moment, a template is provided.

Combined Instruments. It can readily be seen that as far as their relation to the operation of the rig is concerned, each of these instruments complements the other to give a complete and true picture. There are other functions on the rig which affect the main problem but only slightly. These are the weight of the mud and its viscosity but there are so many variables involved in these two functions, and their effect is so slight in comparison to those discussed, that little would be gained by including them on the chart. Muds having identical weights and viscosities could produce different effects on the bit.

All of the instruments are combined in one case which is located in the visionary range of the driller. The preferred location is close to the driller's position as he can then read the instrument faces and also the chart. The driller can always read the last 8 hours of the rig's operation on the chart face.

Application of Information

For the past several years geological departments have requested drilling-time (rate of penetration) data as a means of identifying or correlating specified formations. The driller goes beyond this and not only uses the record obtained on the chart for aid in identifying formations but principally for the information on the condition of the bit. Through a study of the chart he can see where the changes in formation occurred, the relative drillability of the formations, the work the bit has done and its probable condition.

The record may show that during the past few hours or during its entire run the rate of penetration has steadily declined to the point where it is no longer making satisfactory progress. During that time the weight and speed and the mud pressure have not changed but the torque has declined due to the bits not biting into the formation. There can be little doubt in the driller's mind in view of such facts.

If the torque showed an increase instead of a decrease there would be a strong indication that the cuttings were being reworked or the bit was not clean. This condition would be noted after a comparatively short time and corrective measures applied.

A large and sudden decrease in the rate of penetration while other values remain constant indicates that the formation has changed and either the bit is worn out or the speed and weight being used are entirely unsuited to the new formation. Generally, if the speed and weight were not suited to the formation, a change in torque would be evident. The torque reading gives some indication as to whether the jumping and bouncing of the bit are due to the formation being drilled or to a locked cutting element.

The above are the simpler applications of the data shown on the Drillogger instruments and chart. There are numerous other situations in which the driller normally relies on his memory to supply the information but which he can check on the record if the proper recording apparatus is being used.

Pulling a bit which is 80 per cent worn is as uneconomic as pulling one which has had only 20 per cent of its service expended. In the former case the bit cannot be rerun without danger while in the latter the bit can be returned to bottom and the remaining service in the cutters obtained. For this reason it is essential that bits be left in the hole the maximum time possible and not pulled prematurely.

The wider applications of the information obtained with an instrument which records the essential data are in planning the bit program, in selecting the next bit to be run, and in choosing the most effective speed and weight at which to run the bit.

The formations drilled at different locations in most fields are reasonably similar. If one has the record of rate of penetration, weight, speed, etc., from previous wells he can reasonably outline a program for running and pulling bits. In some cases, it may be advisable to "stretch" a bit so a new bit can be run in at a point where it will get the maximum footage. In other cases it may be well to pull a bit before it is completely worn out so that the rate of penetration can be increased materially. The results obtained with different makes and types of bits can also be checked and the most efficient ones selected. This is primarily the work of drilling engineer or superintendent although it may be left to drillers.

How to Choose Bit

If the driller has not been instructed on what bit to run, his selection naturally must depend either on records from previous wells or on his intuition when deciding which bit to run. By examining the records of the previous well or wells which include the type and make of bit run and their condition when pulled, he can see what results were obtained, approximately what the formations are to be encountered and thus make up his mind whether it is best to follow the program on the previous wells or change styles or makes.

The selection of the best cutting speed and weight is always a problem. As long as drilling is progressing reasonably rapidly, the driller's natural inclination is to leave well enough alone. Previous records may show that better results were obtained by running at different speed and weight. On the other hand the driller may be quite nervous because drilling progress is slow and may spend considerable time adjusting speed and weight only to find that he is losing ground; eventually he may decide to pull the bit on the theory "if it doesn't go down it should come out." Actually, his memory has minimized the drilling difficulties at that particular point and a little factual data would easily correct this misimpression.

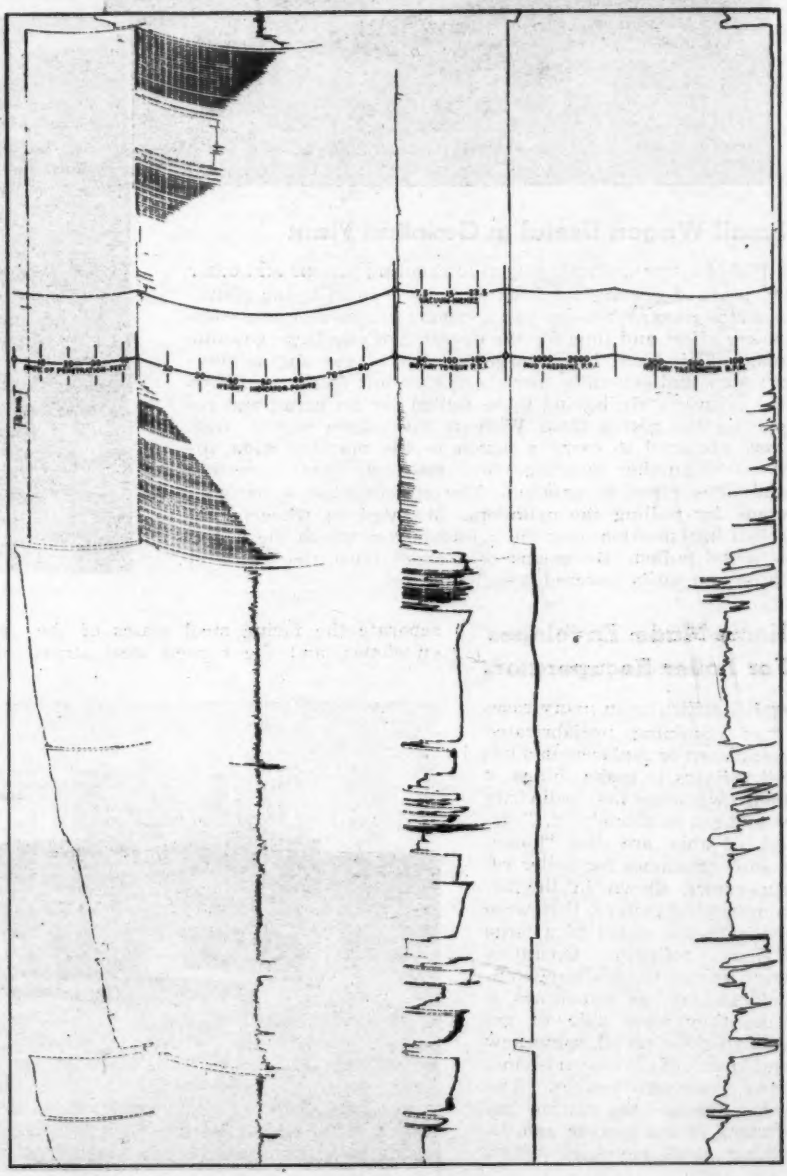
Experimentation with different speeds and weights is only useful when adequate performance records are kept. The drilling crew cannot be expected to keep satisfactory manual records and consequently if such a program is being followed the use of a recording instrument is essential.

Maintenance of such equipment is essential if maximum service and satisfaction are to be obtained. The instruments were designed for use on a drilling rig and will withstand the shocks imposed by drilling but they cannot be abused and mishandled. In view of the critical situation in the materials needed for the manufacture and repair of such equipment, it should receive special consideration.

The instruments are protected as far as possible from radical changes in atmospheric temperature and humidity, dust, sand, abrasive laden fluids, rain, sleet, snow, vibration and maltreatment by the crew.

The instrument will operate much better if it is left alone and not tampered with by anyone not experienced in instrument work. The performance of instruments has been found to be most satisfactory when their care and maintenance are made the responsibility of a single man and all others instructed to leave hands off.

Chart from recording drilling instrument showing torque, rotary speed, pump pressure, weight and rate of penetration variations during latter life of a bit on a California well. Chart travel is downward so the record reads from bottom to top



PLANT PRACTICES

Lube Oil Stripper For Gas Engine

EACH of the gas engines of the compressor plant in a large Oklahoma gasoline plant is equipped with a lubricating oil vapor stripper and filter. The hot lubricating oil being circulated from the engines to the cooling system is passed through the strippers in which any vaporized oil is trapped and returned to the system. The separators also serve to filter the oil of any foreign elements. In trapping vaporized oil, major savings have been realized in lubricating oil requirements. One of the installations, located on the hot-oil line from the engine, is shown in the accompanying picture. The separators were made at the plant. They are of simple design, consisting of a short section of old pipe for a shell.

Small Wagon Useful in Gasoline Plant

USE of a small, simple wagon for hauling pistons and other parts of gas engines from the engine room to the plant's machine shop for repairs and servicing has saved much manpower effort and time for the operator of one large gasoline plant. This plant has a large number of gas engine compressors, and generally there is at least one engine in which the cylinders are having to be pulled for reringing and repairing the piston pins. Without the wagon several men were required to carry a piston to the machine shop, located in another building. Now only one man is needed and little effort is entailed. The operator has a portable crane for pulling the cylinders. Mounted on wheels it is rolled into position over the cylinder from which the piston is to be pulled. By means of a small hoist the piston is lifted and easily lowered into the wagon.

Home-Made Envelopes For Boiler Recuperators

THE difficulty in many cases of obtaining prefabricated equipment or replacements has led refiners to make things in their own shops that ordinarily would not be thought of. Typical of this are the "home-made" envelopes for boiler recuperators, shown in the accompanying picture, that were made in the shops of a large Kansas refinery. Operators were unable to obtain new envelopes, but, as sometimes is true, they were able to get enough sheet metal, some new and part of it second-hand, from various sources. The work included the cutting and shaping of the spacing and dividing steel members which separate the facing steel plates of the envelopes, and the curved steel strips for circulating partitions. The envelopes are of all-welded fabrication.

ABSTRACTS

of papers presented before meeting of American Chemical Society, at Detroit, Mich., April 12-16

THE STABILITY OF FURNACE OIL. A. B. Hersberger, H. C. Cowles, and B. Zieber, Atlantic Refining Co.

THE fouling of domestic oil burner systems by unstable furnace oils is discussed. A stability test is described and data are presented relating this test to results obtained by circulating oils through the essential parts of a gravity feed burner system, the latter results having been found to correlate with practice. Data on both refined and unrefined oils are included.

The stability test is based on the reaction of oils to two metal pairs, iron-copper and iron-lead, under controlled conditions. The test was originally designed for straightrun oils and its limitations in regard to cracked oils are pointed out.

VISCOSITY OF SOLUTIONS IN BRANCHED PARAFFINS. E. H. McArdle and A. E. Robertson, Esso Laboratories, Research Division, Standard Oil Development Co., Elizabeth, N. J.

SOLUTIONS of an alkyd type resin, and of a natural and two substitute rubbers, at high concentrations in two pentanes, four hexanes, five heptanes, and two octanes, show much higher absolute and relative viscosities in the branched paraffins than in the corresponding normal paraffins. An arbitrary method of predicting the viscosity of the resin solutions in branched paraffins has been devised; and an attempt made to use such values in a method of hydrocarbon analysis.

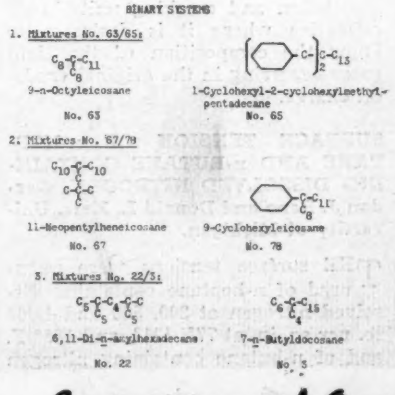
A METHOD FOR EVALUATING THE OXIDATION STABILITY OF DISTILLATE FUEL OILS. J. R. Sabina, R. O. Bender and E. L. Korb.

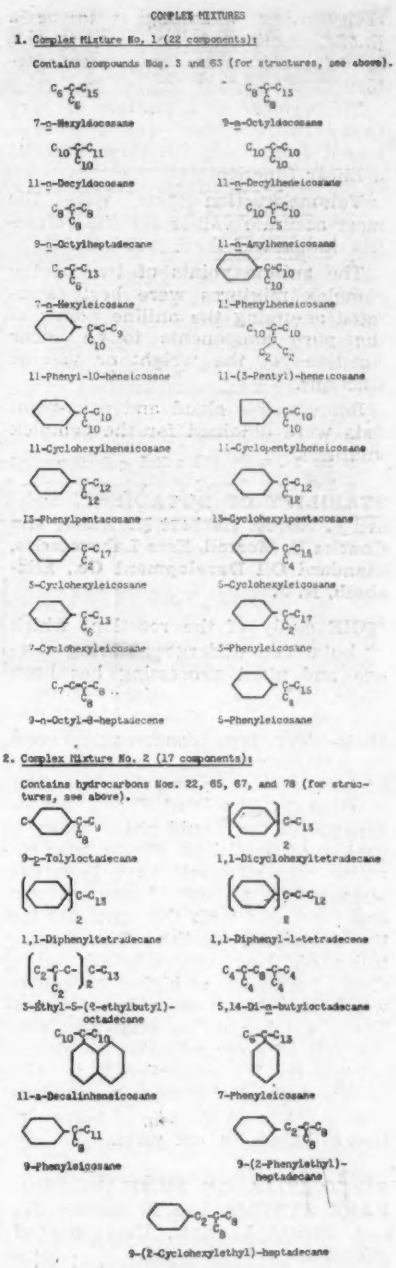
A METHOD for measuring the progress of fuel-oil oxidation under controlled conditions has been developed which can be used to study the effect of chemical treatment of contaminants, of storage conditions, and of chemical adjuvants on fuel-oil stability. Data are presented to illustrate each of the applications. Equipment and technique adopted by A.S.T.M. for gasoline testing is used. Data are also presented to show the correlation obtained between storage tests, field experience, and the present method. The authors believe that it is a useful tool for the study of fuel-oil deterioration.

PROPERTIES OF MIXTURES OF MOLECULAR WEIGHT HYDROCARBONS. R. W. Schiessler, D. G. Clarke, C. S. Rowland, C. H. Herr, and F. C. Whitmore, Pennsylvania State College, State College, Pa.

THE laws of mixtures governing viscosity and density have been studied for three binary systems (each containing three mixtures) of pure hydrocarbons of high molecular weight in the 26 to 28-carbon atom range. In addition, three complex mixtures of pure heavy hydrocarbons have been prepared, the components having from 25 to 32 carbon atoms per molecule.

Complex mixture No. 1 contains 22 hydrocarbons, mixture No. 2 is made up of 17 components, and mixture No. 3 is a blend of Nos. 1 and 2, therefore containing 39 compounds in all. The properties reported for these multicomponent mixtures are as follows: the kinematic viscosities at 68° F., densities and refractive indexes at 20° C., kinematic viscosity indexes, aniline points, and cloud and pour points. Method of predicting these constants (excepting cloud and pour points) from the properties of the pure hydrocarbons by use of mole-fraction, weight-fraction and volume-fraction data are compared. Following are the names and skeletal structures of the hydrocarbons contained in the various mixtures:





The physical constants of these hydrocarbons pertaining to the mixture work are tabulated.

The research on these mixtures revealed the following:

The viscosity of a mixture may be predicted from the viscosities of the components with a fair degree of accuracy by assuming the additivity of fluidities, and using weight-fraction data in the calculations. The accuracy decreased the greater the difference in the viscosities of the components. Approximately the same degree of accuracy was achieved by using A.S.T.M. Chart D (D341-37T) as a blending chart.

The predictability of kinematic vis-

cosity index, assuming it to be a linear function of the mole, weight, or volume fraction, was not satisfactory.

The density of a mixture of pure heavy hydrocarbons was best estimated from weight-fraction data as a linear function.

Volume-fraction data gave the most accurate values for the refractive indexes of these mixtures.

The aniline points of two of the complex mixtures were best calculated assuming the aniline points of the pure components to be linear functions of the weight or volume fractions.

Reproducible cloud and pour-point data were obtained for the complex mixtures.

STABILITY OF BUTADIENE. Richard F. Robey, Herbert K. Wiese, and Charles E. Morrell, Esso Laboratories, Standard Oil Development Co., Elizabeth, N. J.

THE study of the reactions which butadiene undergoes during storage and plant processing has been made. The two reactions of most interest are: (1) dimerization by a Diels-Alder type condensation, and (2) polymerization to plastic materials of high molecular weight. The first reaction is bimolecular and homogeneous in the liquid phase under a variety of conditions. Bimolecular reaction rate constants have been determined for a range of temperatures and compared with the constants for the gas phase reaction. The magnitudes of these constants are quite close. Formation of higher molecular weight polymers is peroxide-catalyzed. For a number of peroxide catalysts the rate of polymerization to plastic substances is proportional to the square root of the peroxide concentration. Data on the rate of peroxidation of butadiene are given.

VISCOSITIES OF METHANE-PROPANE SYSTEM. Leo B. Bicher, Jr., and Donald L. Katz, University of Michigan.

THE viscosities of methane, propane, and four of their binary mixtures (20, 40, 60, 80 mole per cent CH_4) have been determined with an average error of 3.2 per cent at eight pressures (400 to 5,000 lb. per sq. in.) at each of five temperatures (77° to 438° F.) using a rolling ball—inclined tube type viscosimeter. These data are correlated by the three variables, molecular weight, pseudoreduced temperature, and pseudoreduced pressure, with an average deviation of 2.9 per cent. This correlation may be used to obtain the viscosity of any light paraffin hydrocarbon or hydrocarbon mixture with an average error of less than 3.5 per cent.

LABORATORY EVALUATION OF POTENTIAL SERVICE PERFORMANCE OF LUBRICATING OILS. George W. Waters and Elder C. Larson, Wood River Research Laboratories, Shell Oil Co., Inc., Wood River, Ill.

THE corrosion and stability apparatus and method of test are introduced as means for the preliminary evaluation of the quality of lubricants. The distinctive feature of the test is the use of a felt wiping action on the bearing surface to stimulate the action of the journal in the engine. Application of the test to 20 oils upon which extensive engine data have been reported establish it as capable of predicting the oxidation stability and potential corrosivity of lubricants with accuracy sufficient to warrant the use of the test as a useful and reliable tool, both in research and control, to eliminate much of the more costly and more time-consuming engine testing.

DETERMINATION OF BUTANE-ISOBUTANE MIXTURES. Alfred W. Francis, Socony-Vacuum Oil Co., Inc., Paulsboro, N. J.

THE percentage of isobutane in mixture with n-butane is determined by the critical solution temperature of the liquid hydrocarbon with o-nitrotoluene, which is a linear function of the composition. The C.S.T. with n-butane is 12.5° C. and with isobutane 32.8° C.

ANALYSIS OF THE LIGHT CONSTITUENTS IN CRUDE PETROLEUM BY LOW-TEMPERATURE FRACTIONAL DISTILLATION. R. J. Askevold and M. S. Agruss, Pure Oil Co.

AUXILIARY equipment is described which is used in conjunction with the low-temperature fractionating column for the determination of the light constituents in crude petroleum. The results obtained by means of this smaller equipment compare very well with those obtained by pilot plant operation on larger quantities of sample. The method can be used for the calculation of material balances on distillation and cracking units in oil refineries where it is desirable to know the composition of the light gases occurring in the original crude-oil charge.

SURFACE TENSION OF n-HEPTANE AND n-BUTANE CONTAINING DISSOLVED NITROGEN. Gordon J. Reno and Donald L. Katz, University of Michigan.

THE surface tensions were measured of n-heptane containing dissolved nitrogen at 200, 500 and 1,000 lb. per sq. in. at 77°, 131°, and 185° F. and of n-butane containing nitrogen at these pressures at 77° F. The nitrogen, dissolved at 1,000 lb. per sq. in., reduces the surface tension of the pure hydrocarbon from 20 to 29 per cent. The data were used to compute a parachor for nitrogen dissolved in n-heptane of 41. When dissolved in n-butane, the parachor for nitrogen is 60 which is in agreement with the value obtained for pure nitrogen.

THE EXISTENT CORROSIVITY AND POTENTIAL CORROSIVITY OF LUBRICATING OILS. George W. Waters and Hugh D. Burnham, Wood River Research Laboratories, Shell Oil Co., Inc., Wood River, Ill.

BEARING corrosion is analyzed into two concepts: "existent corrosivity" which is that occurring by virtue of the instantaneous chemical state of a lubricant, and "potential corrosivity" which is that occurring under conditions, representative of those of service, which lead to the simultaneous oxidation of the oil. The effects upon both types of corrosivity of temperature, time, the nature of the oil, concentration of reactants, and the physical factors of the tests are described. The important function of protective lacquer films in preventing corrosion and the interference with their action by detergents are demonstrated.

DETERMINATION OF WATER IN HYDROCARBON GASES. Harry Levin, Karl Uhrig, and F. M. Roberts, Texas Co., Beacon, N. Y.

A METHOD is described for determining water (vapor or dissolved) in hydrocarbon gases. It is based on the observation that when a gas containing moisture is contracted with cold dehydrated acetone, the water is retained by the acetone in which it can be determined by an acetyl chloride method. Olefins and diolefins do not interfere and provision is made for correcting for interference by acidic or basic constituents of sample.

APPLICABILITY OF THE A.S.T.M. LAMP METHOD FOR DETERMINING SULFUR IN LUBRICATING OILS. Ernest L. Korb and Edward K. Cornelius, Petroleum Chemicals Testing Laboratory, E. I. du Pont de Nemours & Co.

A METHOD which is simple, accurate, and reproducible has been evolved for the determination of total sulfur in straight and compounded lubricating oils. This method employs the A.S.T.M. sulfur lamp equipment with only one slight modification. The procedure comprises burning a 75:25 per cent by weight mixture of A.S.T.M. naphtha and lube oil and the sulfur liberated in the combustion is determined gravimetrically as $BaSO_4$.

Results on a number of samples

evaluated in the A.S.T.M. sulfur bomb by other cooperating laboratories did not show particularly good agreement. In general, the modified lamp procedure gave results close to the average, or slightly higher than those obtained by the conventional method.

The method has since been extended successfully to all types of heavy fuel oils, so long as they are free of suspended material.

DETERMINATION OF DISULFIDE SULFUR IN GASOLINE. George W. Ayers and M. S. Agruss, Pure Oil Co.

IT has been shown that organic disulfides have an adverse effect on the susceptibility of gasolines to tetraethyl lead and therefore the determination of organic disulfides in gasolines is of considerable importance.

No completely satisfactory method for the determination of such small quantities of disulfide sulfur in gasoline is available in the literature. The reduction of disulfides in the presence of zinc and acetic acid is fraught with many difficulties which have been overcome by (1) the use of a trap to prevent the escape of volatile mercaptans formed, (2) the shortening of the time necessary for complete reduction of the disulfides to mercaptans, and (3) the direct titration of the acetic acid-gasoline mixture without a preliminary water wash.

METHOD OF DETERMINING OXYGEN IN HYDROCARBON GASES. Karl Uhrig, F. M. Roberts, and Harry Levin, Texas Co., Beacon, N. Y.

A METHOD is described for determining oxygen in concentrations of 0.001 to 5 per cent. Oxygen is reacted with copper wetted with ammonia-ammonium chloride solution, the resulting mixed oxides are dissolved in the same solution, reduced to cuprous form, and copper is determined iodometrically as a measure of oxygen in the sample. The method gives accurate results in saturated and unsaturated hydrocarbon gases. Sulfur dioxide, hydrogen sulfide, and mercaptans must be removed and means for doing so are provided.

The method is based on well-known reactions but many modifications have been made, in technique and equipment, which have produced an accurate usable method.

THERMAL VALUE OF GASOLINE METHOD OF TEST. Harry Levin and Charles J. Schlagel, Texas Co., Beacon, N. Y.

A METHOD is described for determining the calorific value of gasoline in an oxygen bomb calorimeter. It involves combustion of the sample contained in a sealed glass bulb wetted with lubricating oil of known calorific value. The technique secures prompt firing, clean burning, and reproducible results.

ABSORPTION AND STRIPPING DESIGN METHOD FOR HYDROCARBONS. W. C. Edmister.

EQUATIONS have been developed for making hydrocarbon absorption and stripping design calculations. Effective absorption (or stripping) factors, obtained by analytical equations from the terminal (top and bottom tray) conditions, are used in this method. Absorption and stripping efficiencies are computed by equations using these effective factors and taking into account the compositions of the wet gas and the lean oil in the case of absorption and rich oil and the stripping gas in the case of stripping.

The application of this method is outlined. For components appearing in both wet gas and lean oil it is frequently necessary to apply both the absorption and the stripping equations. A comparison of this method and other methods with plate-to-plate calculations indicates that this method is an accurate and rapid short cut.

CATALYTIC CRACKING BY FLUID CATALYST PROCESS. E. V. Murphree, C. L. Brown, H. G. M. Fischer, E. J. Gohr, and W. J. Sweeney.

THE fluid catalyst process represents a new chemical engineering technique and has wide application to many industrial catalytic and noncatalytic operations. The present paper is concerned only with the application of this technique to catalytic cracking of petroleum fractions.

When oils are cracked, carbon is deposited on the catalyst, reducing its activity and making necessary its removal by burning with air. In the fluid catalyst cracking process the catalyst is handled as a fine powder, in such a way that it is kept in a fluidized condition at all times, in which form it may be handled substantially as a liquid. The catalyst is conveyed through the reactor by the oil vapor, after which it is separated in dust-recovery equipment, with the product vapor flowing to conventional distillation equipment. The carbonized catalyst then flows down a standpipe in a high density condition, whereby its pressure is increased sufficiently to permit injection into a stream of air, which carries it to the regenerator. In the latter the carbon is burned off, after which the catalyst is separated and the flue gas vented to the atmosphere. The regenerated catalyst then passes down a second standpipe and is injected into the oil vapor going to the reactor. The process is thus completely continuous as regards oil, air, and catalyst flow.

Three commercial plants are now in operation and have given very satisfactory performance. A large number of additional commercial units are under construction.

MASS SPECTROMETER AND ITS APPLICATION TO PETROLEUM REFINING. O. L. Roberts, H. W. Washburn, and L. N. Leum.

THE mass spectrometer as an analytical tool for use in petroleum refining operations is discussed. Examples of several types of mixtures which have to date been successfully analyzed by this new method are presented with comments regarding their accuracy and time required for analysis. The paper concludes with a brief discussion of several processes in which analytical data are useful in control, and in which the mass spectrometer method may prove valuable to the refiner.

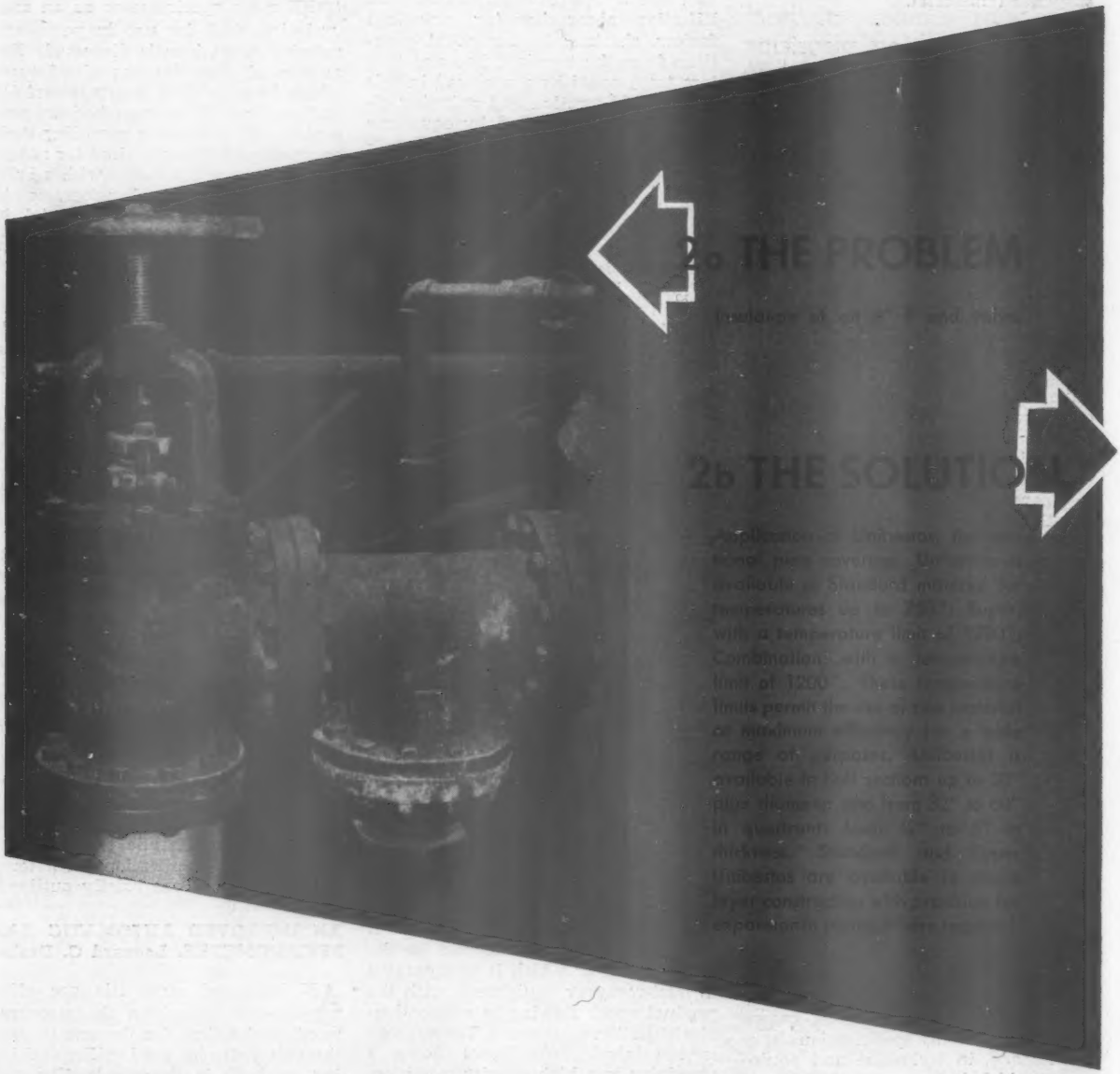
CATALYSTS OF THE MONTMORILLONITE TYPE. R. C. Davidson, F. J. Ewing, and R. S. Shute, Filtrol Corp., Los Angeles, Calif.

THE increased demand for high-octane gasoline has led to the widespread commercial employment of catalysts in petroleum processing. Although both natural and synthetic catalysts have been used, this paper discusses only those falling in the natural category. The early application of activated montmorillonitic type clay for petroleum cracking and the factors affecting the catalytic activity of clay—both as to original raw material and its subsequent treatment—are reviewed. There is also a resume of the theories of catalytic mechanisms as applied to activity and an outline of how these various conditions have led to the development of controlled natural catalysts for meeting wartime requirements. The main uses in catalytic cracking and other possible applications in heterogenous catalysts are briefly outlined.

AN IMPROVED AUTOMATIC GAS EFFUSIOMETER. Leonard C. Drake.

AN improved automatic gas effusiometer based on the measurement of the time for the gas to pass through a standardized orifice (Schilling method) is described. The apparatus employs salt solution as the confining liquid and a series-parallel electric circuit to start and stop an electric stop clock. Electric relays and strategic mercury are not required. The specific gravity of gases, including those containing hydrogen sulfide, may be determined to the third decimal place. The apparatus may be adapted for use in measuring time intervals with other laboratory equipment.

This is the **2ND** *in a series of messages*



TWO ARMY-NAVY "E" AWARDS FOR EXCELLENCE IN WAR PRODUCTION
ONE TO THE CICERO, ILLINOIS PLANT; ONE TO THE PATERSON, N. J. PLANT

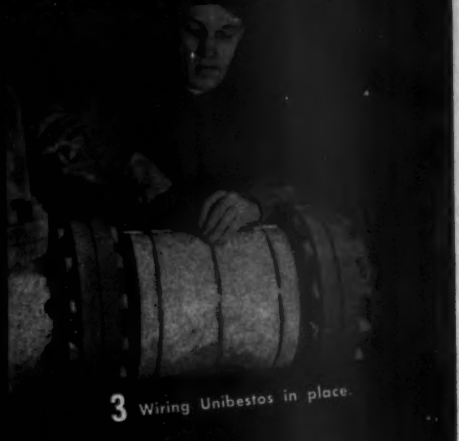
UNION ASBESTOS & RUBBER CO.

GENERAL OFFICES 1821 SOUTH 54TH AVENUE, CICERO, ILLINOIS • NEW YORK • SAN FRANCISCO • PATERSON, N. J.

DEALING WITH THE PROBLEMS IN HEAT INSULATION FACED BY ENGINEERS AND SOLVED BY USING UNIBESTOS

1 Cutting Unibestos, the sectional pipe covering, to cover the body of the 8" T.

2 Fitting Unibestos to the T.

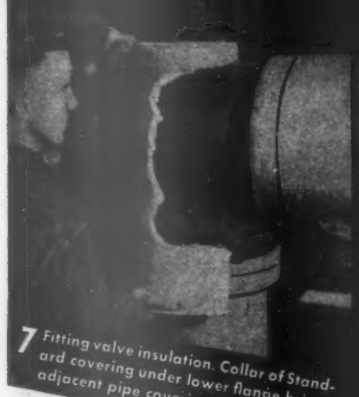


3 Wiring Unibestos in place.

4 Cutting flange insulation for the T. Unibestos cuts clean with ordinary tools.

5 Applying flange insulation.

6 Flange insulation wired in place.



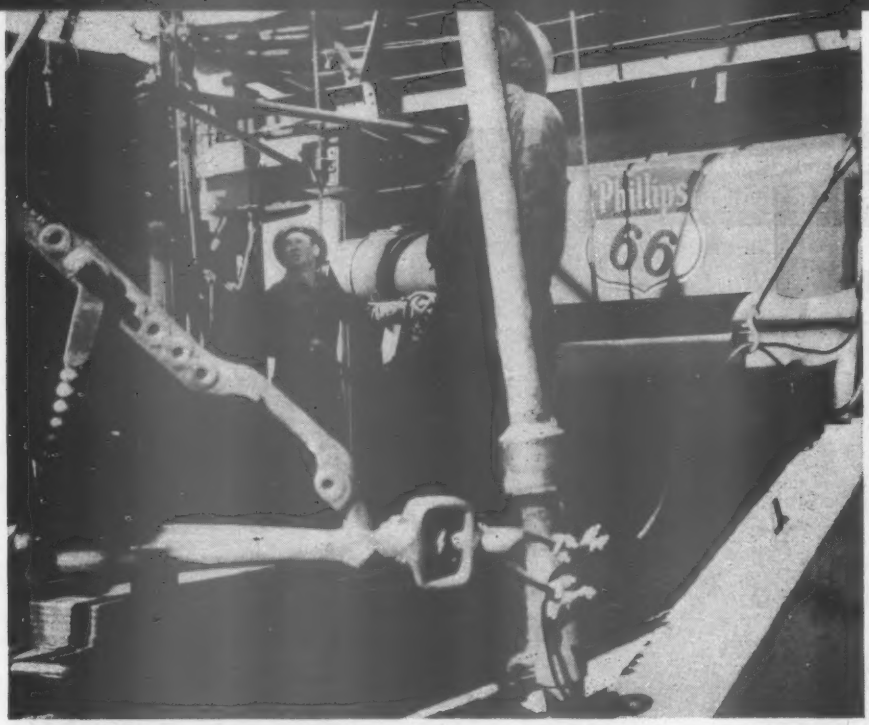
7 Fitting valve insulation. Collar of Standard covering under lower flange brings adjacent pipe covering to proper level.

8 Valve insulation fitted in place.

9 Completed, and ready for finish to be applied. Unibestos can be removed and reapplied easily without damage to material or loss of efficiency.

UNARCO

Insulation for Marine, Railroad, Aviation and Industrial Use



Support for Jerk And Snub Line

THIS drilling crew solved the problem of the jerk and snub line on the lead tongs fouling on the tool joints and on the rubber protectors used on the pipe. The special holder is made from a pair of old sucker rods clamped together, one bolted to the top and the other to the bottom of the head board. Both lines are run through the eye which was made by bending the top rod. The device holds the line up so that it cannot foul and so is possible to get the lead tongs in position where they will bite and the automatic cathead will go in gear.

OPERATING IDEAS

Adjustable Pedestal for Pipe Straightener

WHEN straightening pipe, it must be supported at both ends and drilling-contracting firms that have considerable of this work to do want to be able to rig up easily and quickly. This adjustable pedestal has been found useful by one drilling contractor. The third leg and the roller are hinged to the A-frame. The third leg is adjustable, either by lowering or raising the inner member or by extending its base with the spacing jack at the bottom.

Offset Link for Engine Brace Simplifies Alignment of Unit

BY forming the eye in the end of the 1¼-in. steel link used to fill the space between turnbuckle and engine base in the unit used to secure the engine in line with the draw works at an angle of 45° instead of in line with the shank, it is not necessary to back out more slack in the turnbuckle than will free the hook to release the unit. Also, when aligning the engine when rigging up, one man can handle the offset eye and adjust the turnbuckle without help, and the amount of tightening on the threads of the turnbuckle is more than halved over the straight link customarily used.

PACK GASOLINE PUMPS *... while in operation!*

BY INJECTION WITH PRESSURE GUN

Style 184 . . . especially designed for centrifugal pumps handling gasoline, propane, butane and other light hydrocarbons . . . for reciprocating pumps handling either light or heavy distillates . . . Valves . . . Temperatures to 200° F.

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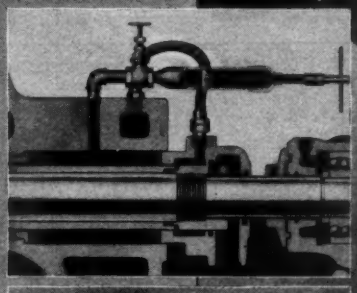

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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Classification of Solvents And Naphthas

I have been searching for a long time for a good discussion of solvents and naphthas. We manufacture them and would like to have complete listing of solvents.—T. L. L.

The enormous number of uses to which naphthas and solvents are being put (many of these not mentioned by writers, etc.) is certain to make this subject confusing. No better reference would seem to be possible than your own company and others who are in the business of suppling solvents.

Three general means of approach may be followed. In one of these, the multitude of uses can be used as the main structure of the comparison: this method is somewhat unsatisfactory because several (highly different) solvents have been used for the same purpose and because the list by such a method becomes enormous. A second method involves an arrangement of solvents in the order of boiling range (or other useful property); this method has about the same disadvantages as the above. Finally, a compromise method may be followed (and is followed herein) by which the solvents are grouped into approximate boiling ranges and the uses are

TABLE 1—APPROXIMATE PROPERTIES OF REPRESENTATIVE SOLVENTS OR NAPHTHAS

Solvent No.	1	2	3	4*	5	6*	7	8	9	10*	11*	12	13*	14*	15*	16	17	18*	19	20
A.P.I. gravity	75.1	75.5	74.6	53°-70.5	71.5	40°	64	62	59.5	37°-58	46°	58	40°	35°	35°-50	50	48	30°-50	45	40
I.B.P., °F.	95	145	125	160	105	179	195	205	200	200	225	220	240	275	303	312	325	357	350	320
10 per cent	115	...	136	...	...	...	...	...	210	215	...	...	...	...	317	322	...	...	...	...
50 per cent	135	150	162	175	180	191	200	210	217	232	242	250	285	300	328	337	350	380	400	485
90 per cent	156	...	188	195	220	245	210	220	232	253	...	270	...	330	352	368	370	397	430	...
E.P., °F.	186	160	206	210	260	275	215	240	247	286	280	300	340	360	376	380	400	410	455	650
Flash (Tag. C. C.), °F.	—73	...	—40	...	...	...	...	...	25	25	...	45	...	80	99	...	115	135	142	145
Kauri Butanol No.	...	30.5	34.5	33.5-49°	34	77°	35.5	37.5	38.5	39-69°	54°	38	72°	73°	35-63°	33	35	31-65°	32	...

*Solvents that are high in aromatic hydrocarbons—High solvency.

TABLE 2—USES OF 20 REPRESENTATIVE NAPHTHAS AND SOLVENTS

Use of solvent—	Boiling range, °F.	Key number of solvent: 1 (95-186)	2 (145-160)	3 (125-206)	4 (160-210)	5 (105-260)	6 (179-275)	7 (195-215)	8 (205-240)	9 (200-247)	10 (200-285)	11 (225-280)	12 (220-300)	13 (240-340)	14 (275-360)	15 (300-370)	16 (312-380)	17 (325-400)	18 (357-410)	19 (350-455)	20 (320-650)
1. Perfume extraction	160-260				x	x															
2. Castor oil or fat extraction	125-300			x	x	x		x		x	x		x								
3. Toluene substitute, lacquer formulas, fast setting varnishes	179-275						x														
4. Seed extraction	160-300				x	x				x	x		x								
5. Rubber cements, tire mfr.	95-370	x	x	x	x	x		x		x	x	x	x			x					
6. Lacquers, art leather, rotogravure ink, adhesive tape	95-370	x	x	x	x	x		x		x	x		x			x					
7. Rosin extraction, shade cloth, rubber dip goods	205-300								x	x	x		x								
8. Brake linings, leather degreasing, bone degreasing	125-400			x	x	x		x		x	x	x	x			x		x			
9. Printer's ink, cellulose lacq. diluent	160-370				x							x				x					
10. Paints and varnishes, thinners	105-455					x				x	x		x		x	x		x	x	x	
11. Textile printing and proofing	160-410				x			x		x	x		x			x		x	x		
12. Paints and coatings (aircraft), paint removers and solvents	179-410						x				x			x	x				x		
13. Paint shop rinsing and cleaning (aircraft)	240-340													x							
14. Floor coverings, wax, polish, wash for printing plates or rolls	200-410									x			x			x		x	x		
15. Dry cleaning, metal and machinery cleaning	200-400									x	x		x			x	x	x			
16. Zylol substitute (in many instances)	275-370														x	x					
17. Flat finishes, rustproof compounds	300-455															x	x	x	x	x	
18. Synthetic resin thinner	357-410																		x		
19. Wood preservatives	312-650															x					x

also grouped and arranged according to boiling range. The compromise method encounters the serious difficulty that two main kinds of naphthas (and solvents) are being sold, those of high paraffinity (highly stable) and those rich in aromatic hydrocarbons (high solvent power for dissolving lacquers, organic chemicals, etc.). This difficulty has been met by listing two types of services: those necessitating high-solvency aromatic naphthas and those which require only the regular paraffinic naphthas, as a single naphtha but designating the properties of the aromatic naphthas with an asterisk.

Fig. 1 and Table 1 indicate the general properties and distillation curves of 20 representative naphthas and solvents, and Table 2 shows typical uses for the 20 naphthas. A lack of uniformity is evident in Table 2 in that a large number of naphthas is being supplied for a single purpose. It should, however, be borne in mind that a single service or use may actually embrace several services; thus, wood preservative (Use 19, Table 2) solvents are used in two ways, as penetrants which flow into the wood along the grain, and spreaders (high-boiling) which spread out within the wood. Nevertheless, the nonuniformity in naphtha specifications as well as differences in solvent shipped by a single supplier, has long been noted.

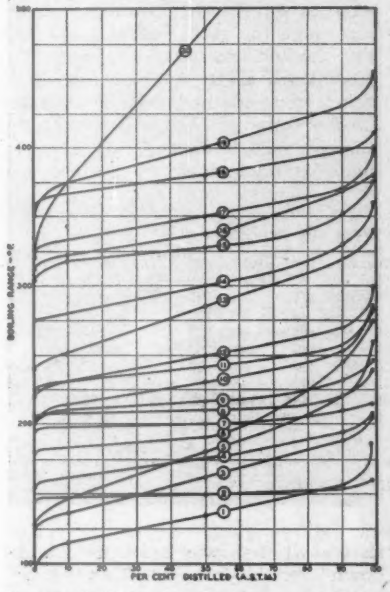

Fig. 1—Boiling ranges of representative naphthas and solvents

Another cause of confusion arises because of the natural differences in solvents which are prepared from different bases of crude oils. Thus, certain aircraft manufacturers have adopted specifications that can be met by refiners on the West Coast but cannot be met by refiners in most other parts of the United States. In some instances the use of highly restrictive specifications is justified but in other instances naphthas having similar boiling ranges are equally suitable regardless of other less vital properties. As an example, Stoddard solvent of a boiling range of 300°-400° F. may have A.P.I. gravities ranging from 43 to 55 depending upon whether the solvent is made from naphthenic, mixed-base, or paraffin-base crude oils, and a similar difference in Kauri Butanol numbers and aromatic hydrocarbon content can also exist without damaging the solvent for dry-cleaning purposes.

When both paraffinic and aromatic solvents can be used for a single purpose, there seems to be a tendency to use higher boiling ranges for the aromatic naphthas. This may be explained in most instances by the higher solvency power of the aromatic naphthas. This also permits a higher flash point and greater safety.

The best discussions of the uses and properties of naphthas are the publications of manufacturers such as the Standard Oil companies (particularly Esso products), American Mineral Spirits Co., Anderson-Prichard Oil Corp., etc., but the third volume of Science of Petroleum (Oxford University Press, New York) has a good discussion by F. N. Harrap.

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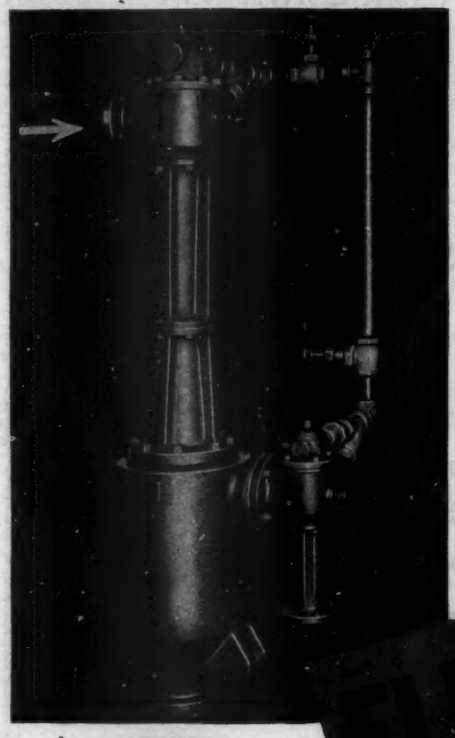

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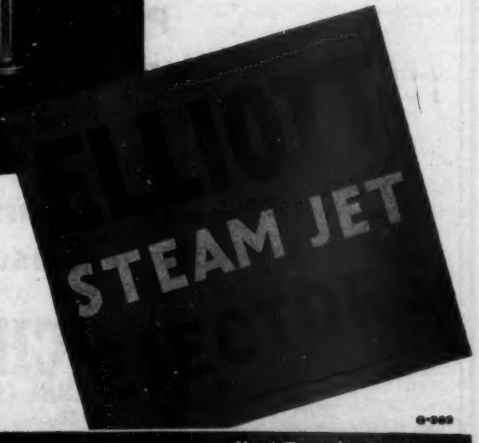

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Removing Overshot From Fish

AFTER broken-off section of pipe has been pulled from hole, the job of getting the overshot loose still remains. This tool is designed so that once the fish has been caught, the hold will not be lost accidentally. If the section which remained in the hole after the breakoff is a long one, the slips may have a very firm grip on the fish and in addition may be lodged rather firmly in the overshot bowl.

Accompanying photograph shows the overshot broken just above the bowl in which the slips (or gripping element), rubber, spacer and spring are located. This happens to be a combination type which will catch either the 3½-in. tool joint or the 3½-in. pipe. The grip in this case is on the tool joint.

Freeing Overshot

To get the overshot loose, the outside of the overshot was jarred with a sledge hammer and finally fell to the top of the slips. The broken-off half of the pin which was up was then broken out and a joint of pipe screwed into the pipe box which was uppermost. The overshot bowl was then supported by the catline while the string of pipe was elevated one joint and again broken out. The overshot bowl then was allowed to slide down over the free end. This is practically the standard practice for freeing an overshot which has caught on a tool joint and which will not release readily.

Getting loose when the grip is on the pipe is a slightly different matter. If the overshot cannot be freed readily, it can be laid down along with the joint and when time permits, the joint inverted so the overshot is down. If tapping will loosen the slips so they fall out, the overshot bowl can then be slipped off the end. If the slips won't drop out of the bowl, it is necessary to pull the overshot the full length of the joint and over the other end.

Different types of overshots are released in different ways, some coming free relatively easy. However, when the overshot doesn't perform according to directions because it has too firm a hold or because it has not been prepared propertly before running, it can be released in the above fashion. Keeping the bowl and the slips or gripping member well lubricated will help insure the easy release of the overshot once the fish has been recovered.

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INCREASED PROFITS MADE POSSIBLE BY REDUCED WITHDRAWAL RATES

THE financial savings and consequent increased profits that can be realized in many instances through production of wells at reduced rates of fluid withdrawal are indicated in the experience of one large company operating in Kansas. In a certain field, this company, instead of attempting to produce its wells at the production rates allowed and recovering the remaining oil in a comparatively short time, undertook to produce the wells at reduced rates, spreading the recovery of the remaining oil over a longer period of time. In this it was possible to install smaller pumping units, tubing and other subsurface equipment than otherwise would have been required. Here important economies were made in equipment investment. While the wells were operated over a longer period of time than would have been necessary with higher rates of withdrawal the prolonged operating costs involved did not offset the savings made in initial equipment costs and the lower daily operating and maintenance costs of the smaller equipment as compared with the larger installation.

Small Units for Reduced Output

In this particular circumstance, it was determined that at the production rates allowed, 20-hp. pumping units would be necessary to produce the wells to their economic limits, figured at 97 per cent water production. It also was determined, however, that 10-hp. pumping units would obtain the same ultimate recovery with an additional year of production. In the handling of the additional volume of fluid possible with the larger pumping unit, 2½-in. to 3-in. tubing probably would have to be installed in the well. With smaller rates of withdrawal of the 10-hp. units, installation of 2-in. tubing and 1½-in. pumps was adequate.

Wells in this field had high initial capacities with "drawdown" productivity ratings ranging from 1,340 bbl. of oil per day to infinity. Also, the wells had high working-fluid levels, characteristic of most Kansas wells. It was calculated that the wells would have bottom-hole pressures of 700 to 800 lb. when economic limits of 97 per cent water production were reached.

A maximum withdrawal rate of 200 bbl. of fluid daily was considered desirable. At 700 lb. pressure and with a withdrawal rate of 200 bbl. daily, the fluid level in a well would not exceed 2,240 ft. A 10-hp. pumping unit with 2,600 ft. of ¾-in. rods and 1½-in. pump, it was determined, could handle this volume of fluid without overloading, and with the minimum allowable of 15 bbl. of oil daily which existed at that time (present minimum allowable is 20 bbl.), a well could be produced up to 92½ per cent water.

10,000 Bbl. of Oil Left

It was estimated that approximately 10,000 bbl. of oil could be recovered from a well from the time it was making 92½ per cent water until it would reach its economic limits of 97 per cent water. To produce 15 bbl. of oil and 97 per cent water daily, it would be necessary to lift 500 bbl. of fluid. For this volume of fluid it would have been necessary to install at least a 20-hp. pumping unit. The alternate was to install the 10-hp. unit and produce approximately 200 bbl. of fluid daily. While extending the production period of the well, the same 10,000 bbl. of remaining oil could be obtained.

When figuring the economic productive life of a well, a lifting and water-disposal cost of 3 cents per barrel was assumed. On this basis a well would become uneconomical when water production reached 97 per cent.

Pumping 200 bbl. of fluid daily, a 10-hp. unit obtained the last 10,000 bbl. of recoverable oil in 2.8 years, with the oil production gradually decreasing from 15 bbl. to about 6 bbl. daily. The same 10,000 bbl. of oil could have been obtained in 1.8 years with a 20-hp. unit pumping at a constant rate of 15 bbl. of oil daily, but the fluid withdrawal rate would have had to be increased gradually from 200 bbl. to 500 bbl. daily.

In either case 203,000 bbl. of fluid would be produced to obtain the 10,000 bbl. of oil. On the basis of 3 cents per barrel for lifting and water-disposal cost and $1.00 gross income per barrel of oil recovered, the profit on the last 10,000 bbl. of oil would be $3,910.

Various Factors in Savings

Various factors are to be considered in the savings to be effected in recovering this oil at slower rates. Among these are the relative costs of the two sizes of pumping units. The additional cost of the 20-hp. pumping unit as compared with that of the 10-hp. unit is approximately $1,000. Also, to produce a well at the higher rate with the 20-hp. unit, an additional cost of approximately $750 would have been entailed in reclaiming the 2-in. tubing in the well and installing 2½-in. to 3-in. tubing which would have been needed to handle the extra fluid. These two items alone represent a saving of $1,750 in favor of the reduced withdrawal rate.

On the other hand, the operation of the smaller pumping unit an extra year to obtain the same amount of oil involves some extra expense. Included in such charges is the interest on the reclaim value of the well equipment for the extra year, which at 10 per cent, would amount to approximately $400. The loss of interest on net earnings, figured at approximately 10 per cent, would amount to about $50. Added to this is the cost of the pumper's time. In this case eight wells were involved. At a wage of $2,000, the cost of the pumper per well for 1 year would figure around $250. These charges total $1,050 extra cost for operating an additional year. As compared with the additional cost of $1,750 for the 20-hp. unit, there is a net saving in the use of the 10-hp. unit and reduced withdrawals of approximately $750.

Additional savings are to be realized by reduced rod and pump trouble made possible by the smaller volume of fluid handled, and from the generally lower operating costs of the smaller equipment. Also, since water is the source of much corrosion trouble, both in subsurface and surface equipment in Kansas fields, the reduced water volume minimizes corrosion with resultant economies in expenditures for equipment replacements.

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Engineering Fundamentals No. 81

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

INDICATED AND BRAKE HORSEPOWER OF COMPRESSION

THE horsepower actually developed in a compressor cylinder may be determined by test, using an indicator. The methods of testing and calculating are similar to the methods already described in this series[1] in connection with engines.

Representative cards are taken on both ends of the compressor cylinder. The area of each card is determined, preferably by the use of a planimeter. The length of the card is then measured by erecting lines through the extremities of the card perpendicular to the atmospheric pressure line and measuring the distance along the atmospheric pressure line between these two perpendiculars.

The average height of each card is then determined by dividing the area of the card by its length. The mean effective pressure is then calculated by multiplying the average height of the card by the scale of the spring used on the indicator when taking the card.

If no planimeter is available, the average height of the card may be determined by the method described in No. 45 of this series.[2]

The indicated horsepower of compression may then be calculated by using equation (2) of Installment 46 of this series, provided, of course, that the other data required in the equation are known.

The indicated horsepower of compression should check, within reasonable limits, the polytropic horsepower calculated from equation (3) or (4) of Installment 76, if the volume of gas being handled by the compressor per unit of time and the proper value of the exponent of compression is used in these equations. It should be noted, however, that equations (3) and (4) are based on an ideally perfect P-V diagram which would not contain the irregularities and imperfections of an actual indicator diagram. It should also be realized that the value of the exponent n is rather difficult to determine accurately, that it may vary from one instant to another in a given cylinder, and that the exponent for the reexpansion line of a given cycle may differ from that for the compression line on the same card. So, at best, the value of "n" used is only an intelligently averaged estimate. For these reasons, the indicated horsepower may deviate somewhat from the theoretical polytropic horsepower.

Brake horsepower of compression refers to the power that an engine must deliver to a compressor not only to compress the gas but also to overcome all of the inherent friction within the compressor including valve losses and pipe friction.

It is evident that because of the difference in design of various types of compressors that no one equation or set of curves for brake horsepower of compression will apply to all situations. So no attempt will be made here to present relationships that are universally applicable. The data given should apply roughly to the average set of conditions. More accurate data for any particular situation may be obtained by contacting the manufacturer or by experimentally testing the given type of machine.

Gill[3] reports that tests have shown that between 10 and 12 hp. per million standard cubic feet of gas compressed per 24 hours are usually required to overcome the friction and losses within a compressor. He also suggests that friction losses vary slightly with pressure ratio. As an example he includes an expression, $1+R_s/350$, as a multiplier to be applied to polytropic horsepower plus losses. Finally his equation becomes,[4]

B.hp. per MM.c.f. =

$$\left[\frac{44.5\,n}{n-1}\left(R^{(n-1)/n}-1\right)+10\right]\left(1+\frac{R^2}{350}\right) \qquad (1)$$

where

B.hp. per MM.c.f. = brake horsepower of compression per million standard cubic feet (at 14.7 lb. per sq. in. and 60° F.) per 24 hours.

n = exponent of compression

R = pressure ratio = P_2/P_1

P_2 = discharge pressure, lb. per sq. in., abs.

P_1 = intake pressure, lb. per sq. in., abs.

Gill clearly indicates that the losses shown as 10 in the equation may vary widely from that figure, and also indicates that the multiplier, $1+R^2/350$, is not applicable to all situations. He particularly recommends that the equation not be used for pressure ratios above 10.

It will be noted that the first part of equation (1) is 1000 times the expression for 1,000 cu. ft. per 24 hours as obtained from equation (4) of Installment 76.

The curves of Fig. 1 are reproduced from published data of the Cooper-Bessemer Corp. They represent standard compressor performance and should yield fairly accurate results for compressors in good mechanical condition operating under average circumstances.

It will be interesting now to compare the results obtained from the curves of Fig. 1 with those obtained from equation (1) by solving some example problems.

Example 1

Problem: What should be the brake horsepower rating of engine which is to drive a compressor that will compress 3.2 million standard cubic feet of gas per 24 hours from 100 lb. per sq. in., gage, to 300 lb. per sq. in., gage?

Solution:

1. Using Fig. 1. Following horizontally along the 300-lb. discharge pressure line until 100-lb. intake pressure line is intersected, and then vertically

[1] See No. 46 of "Engineering Fundamentals," The Oil and Gas Journal, Oct. 22, 1942.

[2] The Oil and Gas Journal, Oct. 22, 1942.

[3] Gill, T. T., "Air and Gas Compression," John Wiley & Sons, 1941.

[4] Numerical constant slightly revised.

downward to brake horsepower scale at bottom of curve, it is found that 61.5 hp. per million standard cubic feet per 24 hours are required.

Then, the engine used should have a brake horsepower rating equal to

$$61.5 \times 3.2 = 197 \text{ hp.}$$

2. Using equation (1). Assume that n is 1.2,[5] and that the atmospheric pressure is 14.7 lb. per sq. in.

$$\text{Then } R = \frac{300 + 14.7}{100 + 14.7} = 2.74$$

Then b.hp. =

$$3.2\left[\frac{44.5 \times 1.2}{1.2 - 1}(2.74^{0.2/1.2} - 1) + 10\right]\left(1 + \frac{2.74^2}{350}\right)$$

$$= 3.2[266.5\ (0.183) + 10]\ 1.021 =$$

$$(3.2)\ (58.8)\ (1.021)$$

$$= 192.5$$

It is noted that the two methods of determining the required brake horsepower give results that check very closely for this particular example. As a result of either calculation, one should probably choose an engine with a horsepower rating of at least 200. An even larger engine might be chosen if it was expected that there was any possibility of the pressure ratio exceeding 2.74 at any time during the life of the installation.

Example 2

Problem: A 12-in. by 20-in. single cylinder compressor is to take in gas at 40 lb. per sq. in., gage, and discharge it at 150 lb. per sq. in., gage. It is to operate at 200 r.p.m. The diameter of the piston rod is 2.50 in. The clearance is 7.3 per cent. Atmospheric pressure is 14.2 lb. per sq. in., abs.

What should be the brake horsepower rating of the engine used to drive the machine?

Solution:

Intake pressure = $P_1 = 40 + 14.2 =$ 54.2 lb. per sq. in., abs.

Discharge pressure = $P_2 = 150 +$ 14.2 = 164.2 lb. per sq. in., abs.

Pressure ratio = $R = P_2/P_1 =$ 164.2/54.2 = 3.03.

Nominal displacement[6] = $D_n =$

754.0 − 16.4 = 737.6 M.c.f./24 hr.

[5]See Installment 80.
[6]See Installment 78.

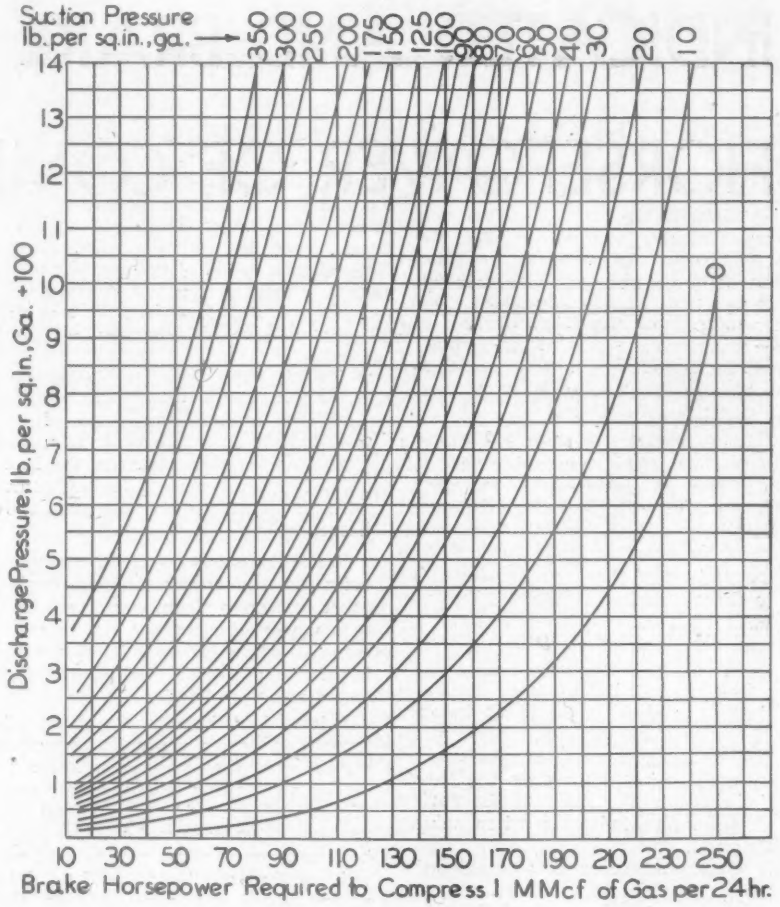

Fig. 1

Assume n = 1.2.

Volumetric efficiency[7] = E_v = 0.98 − 0.073(1.518) = 0.869.

Then, volumetric displacement = $D_v = E_v D_n$ = 0.869 × 737.6 = 641 M.c.f. per 24 hr.

and, capacity = $C = D_v \times P_1/14.7$ = 641 × 54.2/14.7 = 2,360 std. M.c.f. per 24 hr.

Using the curves of Fig. 1, the brake horsepower required to compress 1 million standard cubic feet per 24 hours from 40 lb. per sq. in. gage to 150 lb. per sq. in. gage is found to be 67.

Then the brake horsepower required for driving this compressor, which will handle 2.36 million standard cubic feet of gas per 24 hours, is 2.36 × 67, or 158 hp.

[7]See Installment 77.

Using equation 1,

B.hp. =

$$2.36\left[\frac{44.5 \times 1.2}{0.2}(3.03^{0.2/1.2} - 1) + 10\right]\left(1 + \frac{3.03^2}{350}\right)$$

$$= 2.36\ [267\ (0.2026) + 10]\ (1.026)$$

$$= 2.36 \times 64.1 \times 1.026 = 155 \text{ hp.}$$

Again we find that the result determined by use of the curves checks very closely with the result obtained by using equation (1).

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

Natural Gas

Three Major Gas Lines Given Tentative Approval

WASHINGTON, D. C. — WPB has given tentative approval to the use of 130,000 tons of steel for gas pipe lines to help prevent a threatened shortage next winter. The board's requirements committee has agreed to the terms of a broad program outlined by the Office of War Utilities, the bulk of the steel going into three major pipe-line projects.

The projects are the proposed trans-Kansas line, increasing capacity of the Panhandle Eastern line by looping, and construction of a branch of the latter line into eastern Ohio. The trans-Kansas line has not yet been given final approval, but was said to be definitely under consideration by the Office of War Utilities. The line would tap the Hugoton gas fields.

Under one of the plans being considered the gas would be brought from Hugoton to Wichita, Kans., where a connection could be made with a line to Kansas City.

The work on the Panhandle Eastern project involves the looping of the line at various places between the Amarillo field and Detroit, Mich., and the installation of additional compressors. The objective is to increase the flow of natural gas to war industries in the Detroit, Mich., area. For this project the committee has tentatively agreed to the release of 122 miles of 26-in. steel pipe and 85 miles of 24-in. pipe.

The eastern Ohio extension of the line calls for some 120 miles of pipe line from Maumee, Ohio, to a point between Akron and Cleveland to a junction with a line running north to Cleveland.

Magnolia Seeks Uniform Price in West Cement Field

OKLAHOMA CITY, Okla.—The Corporation Commission last week assumed jurisdiction and began hearing on application of Magnolia Petroleum Co. to fix the price of natural gas at the well head in the Mendano sand zone of the West Cement field of Caddo County. Magnolia filed the application with the commission last January.

In denying motion for dismissal by Cities Service Gas Co., respondent, the commission opened the way for conflict with federal price-fixing authority, for possibility of fixing prices in all gas fields in the state, and for a contest on statutory authority of the commission. According to Reford Bond, chairman of the commission, "the commission is of the opinion the statutes confer jurisdiction pertaining to price," but declared that it would be guided by law and facts in the case.

W. R. Wallace, Magnolia attorney, in his petition asserted that Cities Service had declined to connect plaintiff's wells. Statements by counsel brought out that the present ceiling price for gas in West Cement is 4 cents per thousand feet, while contractural prices are from 3 to 4 cents, an average of better than 3½ cents. R. S. Cullison, attorney for Cities Service, declared that four out of five producers are satisfied with the present price. Magnolia, in its complaint, asks establishment of a price of 5 cents per thousand feet "for all of its gas in said field which said purchaser should be ordered and required to take from your complainant . . ." It also asks the commission to order Cities Service to take gas ratably from Magnolia wells in proportion to the amount of gas owned by the company. It also asks that purchasers be permitted to make crossconnections in the field in order to conserve fuel.

Mississippi River Fuel And Affiliates Cited by FPC

WASHINGTON, D. C.—An investigation of rates and other operating practices of Mississippi River Fuel Corp., Hope Producing Co., Southern Carbon Co. and United Carbon Co., was instituted last week by the Federal Power Commission.

The order launching the investigation outlines objectives as: (1) to determine reasonableness of the Mississippi River Fuel rates in connection with the transportation or sale of natural gas subject to the commission's jurisdiction and (2) whether the Hope Producing Co., Southern Carbon Co. and United Carbon Co. are natural-gas companies within the meaning the Natural Gas Act and the reasonableness of these companies' rates in connection with the transportation or sale of gas.

Mississippi River Fuel does not produce gas and its entire requirements are supplied by United Gas Pipe Line Co., Interstate Natural Gas Co., Inc., Hope Producing Co., Southern Carbon Co. and United Carbon Co., all of which are affiliated with Mississippi River directly or indirectly through stock ownership.

"In any determination concerning the reasonableness of the rates and charges of the Mississippi River Fuel Corp., there must be considered the rates and charges at which it purchases natural gas," the order points out, and adds that the reasonableness of the Interstate Natural Gas Co.'s rates for the transportation and sale of natural gas subject to the commission's jurisdiction has been investigated and is now pending determination by the commission in Dockets G-132 and G-149. This investigation, the order adds, indicates the necessity for full inquiry into the wholesale or so-called "city gate rates" of the Mississippi River Fuel, and points out that the commission also has pending an investigation into the United Gas Pipe Line Co.'s rates, Docket G-148.

Oklahoma and Kansas Near Hugoton Agreement

TOPEKA, Kans. — An agreement between Kansas and Oklahoma is expected to be completed soon on development of the Hugoton natural-gas area of the two states, according to Governor Schoeppel of Kansas. A speedy agreement is being urged by federal authorities, in order that additional pipe-line facilities may be built to augment present fuel supplies for eastern Kansas and other war centers. Unless the states get together on joint proration procedure "the War Production Board might have to step in and take over," conservation authorities of the states have been warned.

Governor Schoeppel explained that drilling of probably 200 new gas wells and construction of at least one pipe line from the Hugoton field to eastern Kansas depended on the agreement, which he said would "provide equitable, fair proration and production."

Kansas Appropriates $6,000 For Carbon-Black Study

TOPEKA, Kans. — The Industrial Development Commission of Kansas has allocated $6,000 for a study of a new process of producing carbon black. The study will be directed by Dr. R. Q. Bewster, head of the Kansas University chemistry department, who proposed the project. According to Dr. Bewster, the new process, involving chlorination of methane, is an improvement on present methods and offers industrial possibilities.

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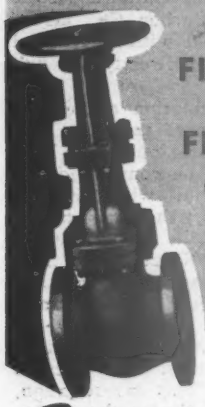
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REFINING

Jersey's Catalytic Patents Available to All Refiners

WASHINGTON, D. C.—Under conditions imposed in a supplemental judgment filed last week by the Department of Justice in the U. S. District Court at Newark, N. J., refining patents covering catalytic processes used in manufacturing high-octane gasoline now held by Standard Oil Co. of New Jersey will become available to all refiners.

The ruling was entered by Judge William F. Smith, and was consented to by all parties, following an agreement between the Department of Justice and Standard as to application of the consent decree entered on March 12, 1942, to the company's catalytic refining patents.

Under the terms of the March 25, 1942, consent decree, Standard was required to give unrestricted, royalty-free licenses during the war on important synthetic-rubber patents and other patents it held under agreement with I. G. Farbenindustrie.

The supplemental judgment entered Wednesday is designed to clarify application of this decree to the catalytic-refining patents by specifying that the compulsory licensing provisions of the decree apply to such patents, although a reasonable royalty may be charged. In addition to their usefulness in the production of high-octane gasoline, the patents also cover processes involved in the production of butadiene, which is used in the manufacture of synthetic rubber.

The stipulation and supplemental judgment were filed following an agreement between the company and the Government under which, (1) the company is required to grant licenses on such refining patents to any person or corporation making application; (2) the company will receive a

Sketches of Plant Operators

THE career of William Frank Thiede, general superintendent of the Bayonne plant of the Standard Oil Co. of New Jersey, is an outstanding example of the field of opportunity afforded by the oil industry to those who are prepared and willing to accept it. In 1938 Mr. Thiede was appointed general superintendent of a refinery of the company for which he started to work almost 30 years earlier as a crude-oil sampler.

Mr. Thiede's career is notably devoid of the spectacular except in the contrast between his present position and the job at which he started with Standard. He was born at Stapleton, Staten Island, New York, in 1895. Stapleton is only a few miles from Standard's Bayway refinery where he went to work and from the Bayonne plant of which he became superintendent in 1938.

Formal education for Mr. Thiede ended early with his graduation from Battin High School in Elizabeth, N. J. However his practical education had already begun with his job as crude-oil sampler at nearby Bayway in 1909.

Mr. Thiede remained at Bayway for 29 years. During those years he progressed steadily from one position to another and higher one until he finally reached the post of assistant general superintendent of the largest oil refinery in the eastern United States. In January 1938 he left Bayway in a transfer which sent him to Bayonne where he had been appointed acting general superintendent. Later in that year he became general superintendent, the position he now holds.

"reasonable royalty" for such licenses; and (3) the company will be entitled to require crosslicenses under the licensee's related patents in cases where such crosslicenses might be necessary to prevent Jersey Standard from being placed at a competitive disadvantage.

The supplemental judgment disposed of questions raised by a petition filed by Standard of New Jersey for court directions regarding crosslicensing arrangements between Standard and other companies under a recommendation of the Petroleum Administration for War that several oil companies cooperate in developing and licensing related types of catalytic refining processes for the duration of the war.

Lloydminster Plans Refinery Expansion

Lloydminster Refineries, Ltd., successor to Shaw Petroleum, refinery division, is planning to expand capacity of its Alberta, Canada, plant to 500 bbl. daily. The Lloydminster topping plant now has capacity of 300 bbl. daily and includes an asphalt unit.

Gulf Completes Aviation Unit at Port Arthur Plant

PORT ARTHUR, Tex.—J. Frank Drake, president of the Gulf Oil Corp., last week announced completion of a new Houdry catalytic-cracking unit for the production of 100-octane aviation gasoline at the company's refinery here.

The completed unit is a part of Gulf's aviation-gasoline program being carried out in cooperation with the Government. It was entirely financed by the Gulf Oil Corp., which to date has expended something like $15,000,000 on increasing its aviation-gasoline facilities at Port Arthur. The entire output of these facilities is under contract to the Government.

"This new Houdry unit," Mr. Drake said, "marks the completion of only a part of Gulf's construction program. Work is continuing on other projects here which will further increase our output of 100-octane gasoline.

"This unit marks a many-fold increase in our output of 100-octane gasoline at Port Arthur since 1938, when we put in operation one of the first high-octane gasoline plants in the country—at that time a wholly untried and unproven process.

"Since 1938 Gulf's facilities for producing this superfuel have been expanded almost continuously, each new unit embodying the latest technological developments. Early in 1940 we added an alkylation plant, the newest development in aviation-gasoline manufacture at that time. Early this year we completed a second alkylation plant. This new catalytic-cracking unit, too, is one of the latest developments in refining technology.

"The new unit was about 12 months in building. It covers a large area and includes many novel features. The control room, which houses the instruments and gages that tell the operators at a glance the conditions at any point on the huge unit and assists them in controlling these conditions for the most efficient operation, is completely air-conditioned."

Illinois Told Law to Keep Crude in State Illegal

SPRINGFIELD, Ill.—The Illinois Legislative Council, which conducts research on possible future legislation for the state, reported last week that a proposed act to give Illinois refineries preference over out-of-state refineries in the purchase of crude oil produced in the state apparently is unconstitutional.

"It seems obvious that in view of federal Supreme Court decisions a law or rule specifically regulating the shipment of crude oil and vesting preferred purchase rights in local refineries would be unconstitutional," the report said.

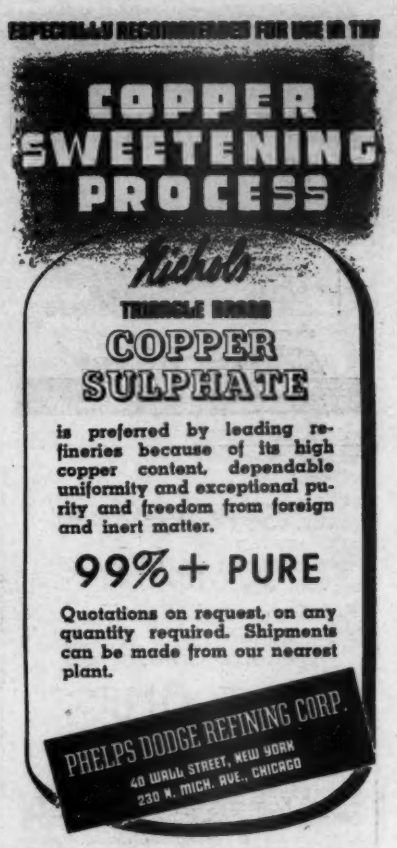
The council prepared the report at the request of Rep. Edward J. McCabe of Chicago, a member of the house committee on natural resources, who sought to learn whether other oil-producing states have laws preventing operators of oil wells from selling crude oil to refineries outside before satisfying requirements of refineries in the state.

Practically equal in Illinois, according to the report, is crude-oil production and refining capacity on an average daily basis. Refining capacity of 20 Illinois refineries in 1942 was 276,000 bbl. per day, while average production was about 280,00 bbl. daily.

Paluxy Asphalt Co. Plant Capacity Is 4,000 Bbl. Daily

Crude-oil capacity of the Paluxy Asphalt Co., Yazoo City, Miss., currently is 4,000 bbl. daily and the refinery has a cracked gasoline capacity of about 1,200 bbl. daily. The company's asphalt plant which started operations in January 1942, has been on uninterrupted production.

Capacity of Paluxy's crude-oil unit was inadvertently listed as 3,000 bbl. daily in The Journal's refinery survey, March 25, but operators now advise that expansion has raised this figure to 4,000 bbl. The refinery has always included a cracking unit.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PIPE LINES

WEP Eastern Extension More Than Third Laid

The laying of approximately 311 miles of pipe for the eastern extension of the War Emergency Pipelines, Inc., Texas-East Coast crude-oil line means that more than a third of the pipe laying has been done in spite of the bad ground and weather conditions of the winter and early spring. This includes 45 miles of 20-in. for branch lines east of Phoenixville, Pa., and 276 miles of 24-in. on the main line. By the end of this week it is believed that nearly 340 miles will have been laid.

Shipments of pipe are expected to arrive soon for the construction of the 20-in. Texas-East Coast refined products line. Preliminary operations will be well under way at the end of this week.

Pipe has been laid half way across the Mississippi River for the construction of the second WEP 24-in. river crossing and dredging for this crossing has been completed. Preparations are being made for laying pipe for the 20-in. river crossing. A strike called by local labor officials for men engaged in laying the crossing has been settled and operations were resumed at the beginning of the week.

Elsewhere in this issue, deliveries of oil from the Norris City, Ill., terminal of the 24-in. line are discussed in an article dealing with the acceleration in deliveries coming as the result of having a larger number of tank cars available for the eastward movement.

WEP has established a branch office in the Professional Building, Plainfield, N. J., under the direction of William G. Heltzel, vice president, Stanolind Pipe Line Co., who is now serving as special assistant, concerned with the building of eastern terminal facilities.

Cities Service Applies for Hugoton-Wichita Line Permit

Cities Service Gas Co. is reported to have filed application with federal authorities for permission to build a $14,000,000 natural-gas pipe line to extend from the Hugoton field of southwestern Kansas to Wichita, Kans., where it will connect with the company's system for local distribution and for transmission to the Kansas City area.

War Production Board, according to reports, has tentatively approved the use of 130,000 tons of steel for construction of natural-gas pipe lines to avert a threatened shortage next winter. Another line to be built with steel from this allotment is said to be the East Ohio Gas Co.'s 120-mile 20-in. line connecting with the Panhandle Eastern Pipe Line Co. at Maumee, Ohio.

PAW Considers Stanolind Proposals for 16-In. Line

While the petroleum administrator is considering the application of Stanolind Pipe Line Co. for the laying of a 383-mile 16-in. line from the Slaughter field, West Texas, to Drumright, Okla., there has been much discussion regarding the relation of such a project to other pipe-line operations.

It is apparent that the construction of the 20-in. products line from Gulf Coast refining centers to the East Coast, steel for which has been completely authorized recently by WPB, will indirectly affect West Texas. With this eastward outlet, it will be possible for Gulf Coast refineries to draw more heavily on West Texas for supplies of crude. Consequently, some of the capacity of West Texas-Gulf Coast pipe lines which has been idle since the withdrawal of ocean tankers is sure to be utilized, according to those who have studied the situation.

There has been some speculation on the possibilities of having the West Texas-Drumright line built of 20-in. instead of 16-in. pipe. With the construction of six pump stations it is believed that a 20-in. line could move West Texas crude at the rate of about 190,000 bbl. per day. A line of this kind might provide transportation for other companies in excess of Stanolind's requirements.

Officials of PAW as well as the oil industry itself now believe the greatest potential production of crude in the United States is located in West Texas. Lack of transportation to move the oil to refining centers and consuming points has seriously retarded this development during recent years.

Harold L. Ickes and Ralph K. Davies pointed out that production in

the Mid-Continent area is falling off steadily and within the next year or two it will be necessary to supply refineries in that area with oil from West Texas.

Mr. Davies declared "the time may soon come when refineries in the Mid-Continent area will have to be supplied from the more abundant reserves of West Texas."

Mr. Ickes said, on the basis of preliminary studies, it is possible the supply situation for Mid-Continent refineries may become "acute" during 1944 unless steps are taken meanwhile to provide additional amounts of crude for their operation.

The PAW study will also include other proposals for moving West Texas crude to consuming centers and no decision on the Stanolind application or other similar proposals will be reached until the whole problem has been surveyed, officials made clear.

West Texas-California Project Discussed

Still under discussion in Washington is a proposal to construct a crude pipe line from West Texas to California primarily as a wartime measure. While this project has received considerable support it would require such a large amount of steel and other critical materials that officials have expressed doubt as to whether it could be built at this time. Nevertheless, it is generally known that California is no longer able to produce sufficient oil to meet military demands on the Pacific Coast. If the military leaders in anticipation of an all-out attack upon Japan at a later date feel supplies to the West Coast should be materially increased next year, there is a distinct possibility that this proposal might receive favorable consideration.

Corpus Christi-Houston Line to Be Ready June 1

Placing of the Southwest Emergency pipe line from Corpus Christi to Houston, Tex., into operation sometime in June was indicated last week by the transportation committee of District 3, Petroleum Administration for War.

The construction of this line, which will be used for the movement of crude and heating oil from Corpus Christi to Houston, is financed by the Defense Plant Corp. It involves the purchase of a large gas line, extending from Refugio to Pierce Junction, Harris County, Texas, from the Houston Gulf Gas Co., affiliated with United Gas Pipe Line Co.

The complete project will require reversal of lines by the Barnsdall Oil Co., Corpus Rosa Pipe Line Co., Humble and Texas companies from Corpus Christi to the initial station of the Southwest Emergency line at Refugio and the construction of a new section from Pierce Junction to the Houston terminal, located at the Galena Park terminal of the Texas Co.

Plans for Coastwise Barge Movements Are Curtailed

Since passage of the transportation bill by Congress last year, persistent efforts have been made to have projects built which were included in its program. Because of the greater need for materials for pipe lines which can function most effectively, final authorization has not been given for most of the projects. The principal project completed to date is the Trans-Florida pipe line financed by DPC.

The appropriations committee of the House of Representatives by a 21 to 19 vote struck from the War Department civil function supply bill for the fiscal year 1944 an item of $44,000,000 for construction of the Florida Barge Canal.

The appropriation had been recommended by a subcommittee which said construction of the canal from the St. Johns River across Florida to the Gulf of Mexico would help relieve the eastern petroleum shortage.

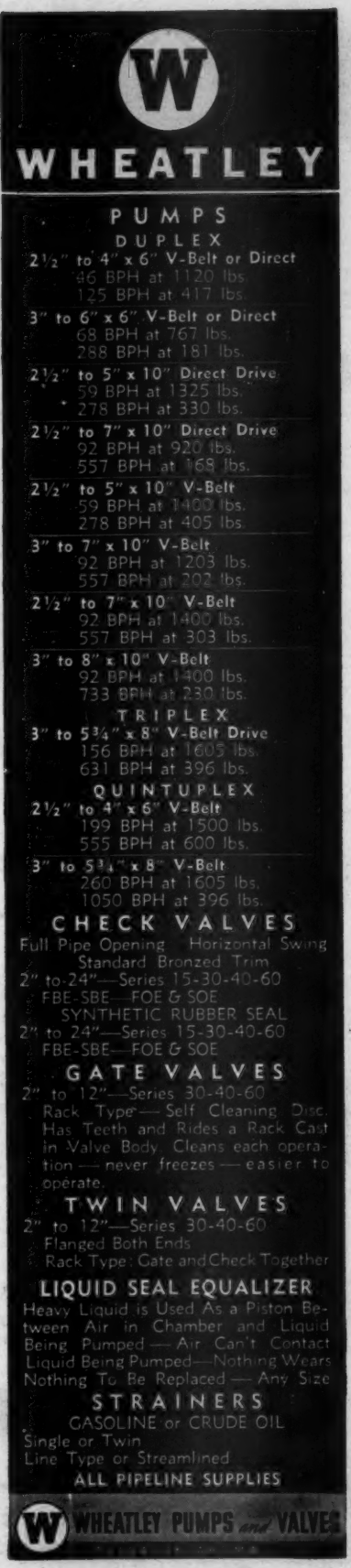
In turning down the subcommittee's recommendation, the full committee said the project "cannot be looked to for any alleviation of the fuel oil or gasoline shortage in the eastern seaboard area for many months to come" and that pipe lines already built or being constructed, supplementing tank cars and a small amount of water transportation, "will take care of the eastern seaboard area in the next winter in a normal way."

Sen. Burnet R. Maybank of South Carolina has recently introduced a resolution for the construction of a crude-oil pipe line from the Tinsley oil field at Yazoo, Miss., to Charleston, S. C., or to Savannah, Ga. The resolution was referred to the Senate commerce committee.

According to original proposals for a line from Mississippi to Charleston or Savannah, movements of petroleum were to be made from these ports by barge to the industrial sections of the Northeast.

Sun Applies for Permit to Remove Gathering Line

Sun Pipe Line Co. has applied to the Railroad Commission of Texas for permission to remove a 4-in. oil pipe line which formerly served the North Dayton field of Liberty County, Texas.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278 BPH at 330 lbs.
2½" to 7" x 10" Direct Drive
92 BPH at 920 lbs.
557 BPH at 168 lbs.
2½" to 5" x 10" V-Belt
59 BPH at 1400 lbs.
278 BPH at 405 lbs.
3" to 7" x 10" V-Belt
92 BPH at 1203 lbs.
557 BPH at 202 lbs.
2½" to 7" x 10" V-Belt
92 BPH at 1400 lbs.
557 BPH at 303 lbs.
3" to 8" x 10" V-Belt
92 BPH at 1400 lbs.
733 BPH at 230 lbs.
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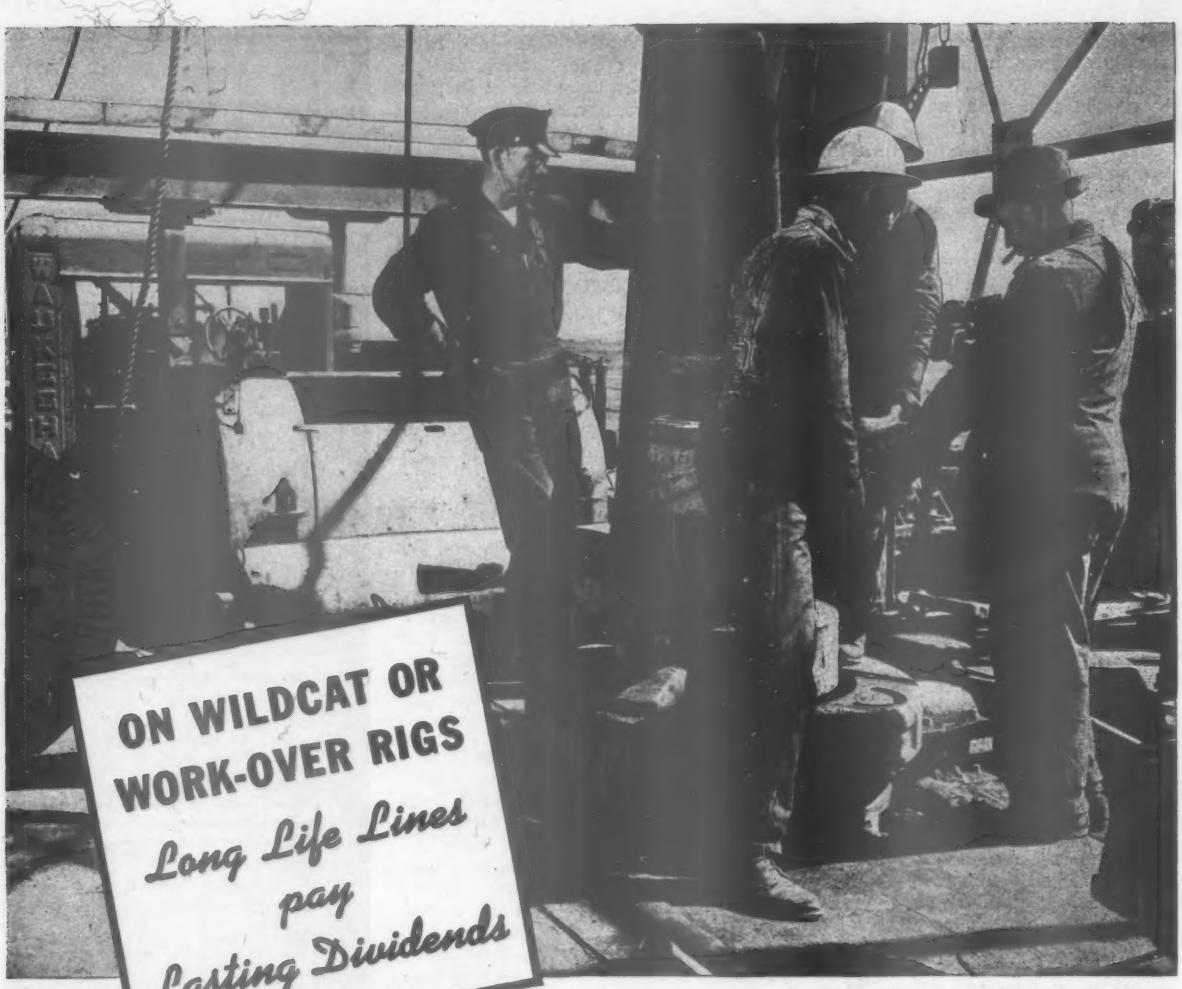

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F-43

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Exploration and Drilling

Week's Highlights

ONE of the criticisms most frequently voiced concerning geologists is that they did not find many of our largest fields, including East Texas. The inference, of course, is that they could not. That is far from correct and at the present time it seems advisable to substitute a little constructive financial assistance for criticism. There are many basins in the United States and one characteristic of all basins is the presence of sands which wedge out updip toward the flank of the basin.

In many basins production has been found in these wedging sands and the chances are that it can be found in many others. A. I. Levorsen pointed out last week that 10,000 miles of old shore lines were well known but essentially unexplored. It is probable that the total mileage as known to individual geologists is considerably greater. In fact, it appears to the writer that he could add a fair proportion himself to the number mapped by Levorsen, some flanking producing basins and others flanking potentially producing basins.

Prospecting for these buried wedges differs from prospecting for structures and oil companies need not feel that they are doing everything possible by having more geophysical parties in the field than at any previous time. These parties are not looking for this type of field as a rule but for fields of the structural type and it is this group of discoveries which have been declining rapidly in size during the past few years. Thus, while the geophysicist is becoming more effective in finding oil, the fields which he is locating, being harder to find, are smaller.

There is great need for increased drilling of stratigraphic tests and for detailed study of the results of these tests. There is also great need for more surface mapping which is far from dead. In fact two of the largest discoveries of recent years were found by this so-called antiquated method, namely Hawkins and Tinsley. There is great need for more study of cores and for more coring of wildcats along with more mechanical logging. Convergence studies using a great many key horizons rather than a few will throw much light on the stratigraphic details in basins. Geologists and executives alike must think less of structural highs and more of pinchouts, unconformities and other similar features which govern the accumulation of large quantities of oil.

There are no new exploration methods but there are a great many partially tried old ones. There are no discoveries made by random drilling which could not have been found by the use of geology as it is known today. Application of these methods is expensive but cannot be balanced against the cost of the discovery well alone. All of the randomly drilled dry holes are a part of the exploratory cost of finding a new field.

One of the comments frequently heard about dry holes is that they may not have yielded much oil but they surely did contain a lot of information. The statement is unfortunately true as well as the conclusion that in a great many instances too little use has been made of the information provided.

TEXAS GULF COAST: A new oil pay has been found at Katy by a well 4,000 ft. east of the original oil discovery (p. 149).

SOUTHWEST TEXAS: Following discovery of oil north of Rio Grande City in Starr County, an intensive leasing campaign is under way and several wells are being started (p. 152).

CALIFORNIA: Two gas fields have been found in the San Joaquin Basin, in Madera and San Joaquin counties, respectively (p. 150).

COMPLETIONS IN ALL FIELDS . . .

(Week ended April 10, 1943)

	Oil	Gas	Dry	Total	Footage	Total comp. to date 1943	1942
N. Y., Pa., and W. Va.	51	11	2	64	125,119	822	988
Ohio	1	7	1	9	21,103	190	258
Indiana	1	1	4	6	6,071	72	83
Kentucky	9	3	7	19	44,236	80	68
Illinois	13	0	20	33	75,160	491	445
Michigan	2	1	4	7	16,764	113	173
Kansas	19	1	17	37	127,485	363	408
Nebraska	0	0	0	0	0	7	12
Missouri, Iowa	0	0	1	1	560	4	6
Oklahoma	6	3	8	17	60,568	300	407
Texas:							
North Central Texas	16	0	28	44	96,875	318	381
West Texas	12	0	3	15	57,713	226	530
Texas Panhandle	3	1	0	4	11,841	49	144
Eastern Texas	3	0	4	7	36,083	67	133
Texas Gulf Coast	3	0	2	5	39,184	102	244
Southwest Texas	8	1	14	23	100,655	231	398
Total Texas	45	2	51	98	342,351	993	1,830
North Louisiana	4	0	1	5	29,920	76	146
Louisiana Gulf Coast	2	0	2	4	41,494	85	159
Total Louisiana	6	0	3	9	71,414	161	305
Arkansas	4	0	1	5	16,849	81	38
Mississippi and Southeast	3	0	6	9	50,571	23	17
Montana	1	0	2	3	6,076	43	39
Wyoming	5	0	2	7	25,498	33	25
Colorado, Utah	1	0	1	2	2,181	5	4
New Mexico	2	0	2	4	12,834	59	57
California	21	2	5	28	102,881	288	237
Total United States	190	31	137	358	1,109,721	4,108	5,411
Total previous week	194	22	94	310			
Week ended April 11, 1942	182	28	104	312			

ROCKY MOUNTAIN AREA

Four Wells Staked at Elk Basin With Tensleep as Objective

DENVER, Colo.—The development and exploration campaign in and around the Elk Basin field following a discovery in the Tensleep sand last December in the Minnelusa Oil Corp. 1 Henderson received considerable impetus this week with four new locations. The MacKinnie Oil & Drilling Co. spotted its 2 Northern Pacific, NE NW NW 5-57n-99w, a mile to the south of the Tensleep discovery and an offset to its 1 Northern Pacific, a gas discovery in the Dakota in 1941. This followed a deal with Fred Goodstein, of Casper, calling for 10 wells on an acreage basis without cost to Mackinnie for a half interest in 1,600 acres. Yale Oil Corp. made a location for 1 Watson, NE NE SE 36-58n-100w, a wildcat 1¼ miles southwest of the Minnelusa discovery. Minnelusa made two locations, 3 E-T Henderson, NE SE NE 31-58-99, a south offset to the Tensleep discovery, and 1 Zimmerman, NE NE NE 34-9s-23e, across the line in Carbon County, Wyoming, ½ mile west and north of the Stanolind 1 Dengler, the most northerly test in the area. Three wells now are drilling in addition to the new operations reported.

Oregon Basin field. — Two completions in Oregon Basin by the Ohio Oil Co. reported this week were considerably down on the flanks and showing some water. Its 8 Lavender-OPC, which made 125 bbl. per day, 15 per cent water, from the Embar, is an outpost on the west side of the south dome. Its 3 Ora Sonners-2, which made 150 bbl., 35 per cent water, from the Embar, is on the southeast side of the north dome and a mile northeast of the saddle between the two highs.

Northwest New Mexico wildcats.— Continental Oil Co. 1 Tocito, SW SW NE 17-26n-18w, wildcat on the Tocito dome, San Juan County, joint with Stanolind Oil & Gas Co. and Standard Oil Co. of Texas, is at a critical stage, drilling at 6,627 ft. in lime. A drill-stem test at this depth showed 458,000 cu. ft. of gas Southern Union Production Co. has spotted a wildcat east of Fulcher basin San Juan County, in its 1 Government, C SW 18-29n-11w. Fulcher basin supplies gas for central New Mexico

Sherrard dome.—Sinclair-Wyoming Oil Co. 1 King, abandoned at 3,170 ft., drilled to outline the productive area of the Sherrard field is located ½ mile north of 1 Mary Carter, the gas discovery in 1941 in the Dakota series for 8,000,000 cu. ft. Its 2 Mary Carter, which made 4,000,000 cu. ft., is ½ mile east of the discovery.

Middle Allen Lake.—Ohio Oil Co. 2 Union Pacific-Wister, abandoned at 2,183 ft., was a wildcat located 4 miles southeast of the nearest producer in the Allen Lake gas field and 1½ miles west and north of the nearest gas well in the East Allen Lake field.

Converse County, Wyoming. — Core-drilling in the Douglas area to work out the subsurface geology inaugurated last fall by the Superior Oil Co. is being resumed under concontracts by Superior and the Ohio Oil Co. with the Garretson-Snively Co., slim-hole rotary drillers, for five wells to go to 2,500 ft. These will be put down on the Orpha block west of Douglas where the Superior company has acreage in 32n-72w, and the Ohio company a block in 32n-73w. Superior will deepen two of the old holes from around 800 ft. and drill another from the surface. The Ohio company will drill two wells from the surface. The operation is of particular interest due to unconfirmed reports that last fall the Superior cored a 20-ft. saturated section in the Sundance in the southeast corner of 8-32n-72w. The depth is not reported, but since the red beds outcrop in that general area it is presumed that it was above the contract depth for the new test holes. The Orpha block is just west of a wide area prospected with a number of shallow holes several years ago in what was called the Shawnee district, good shows of gas and some shows of oil being encountered at 600 to 700 ft. in the contact between the Tertiary and Cretaceous. In the same general area also is the Brenning basin district known for many years for its small but uncommercial shows. In 1930 the Phillips Petroleum Co. did extensive work in the area and took up a large block.

DAILY AVERAGE PRODUCTION FOR WEEK

	Apr. 10 crude oil	April PAW quota all oils	Apr. 3 crude oil
Arkansas	71,200	78,600	70,600
California	780,000	823,700	789,750
Colorado	6,450	7,400	6,075
Eastern fields	97,800	114,300	93,200
Illinois	235,900	251,900	228,500
Indiana	15,950	16,000	15,900
Kansas	309,300	309,900	314,800
Louisiana	346,800	359,300	339,100
North Louisiana	*88,900*	.....	*89,100*
Louisiana Gulf Coast	*257,900*	.....	*250,000*
Michigan	60,800	63,700	56,100
Mississippi	55,000	50,000	54,400
Montana	21,570	24,600	22,535
Nebraska	2,250	2,600	2,200
New Mexico	105,490	105,700	105,620
Oklahoma	344,100	379,300	344,000
Texas	1,388,700	1,502,000	1,393,650
East Texas	*319,800*	.....	*323,000*
West Texas	*214,250*	.....	*215,000*
North Central Texas	*134,950*	.....	*137,100*
East Central Texas	*99,700*	.....	*99,800*
Texas Panhandle	*91,000*	.....	*88,500*
Texas Gulf Coast	*457,850*	.....	*458,550*
Southwest Texas	*71,150*	.....	*67,700*
Wyoming	92,500	97,100	94,825
Total United States	3,933,810	4,186,100	3,930,255
Total production Jan. 1-Apr. 10, 1943			388,361,280 bbl.
Same period last year			393,370,380 bbl.

COLORADO COMPLETIONS

Rangely, Rio Blanco County: Raven Oil & Ref. Co. No. 46, CEL SW SE 30-2n-102w, dry at 1,471 ft.

California Oil Group, Ltd. 7 McLaughlin, NW SW 33-2n-102w, T.D. 710 ft., 50 bbl. per day from fracture zone.

WYOMING COMPLETIONS

Lance Creek, Niobrara County: Continental Oil Co. 7 Rodeo-1, SE SW SE 27-36n-65w, T.D. 5,390 ft., 7-in. 5,331 ft., Leo sand 5,338-90 ft., swabbed 125 bbl. oil in 7 hr.

Middle Allen Lake, Carbon County: Ohio Oil Co. 2 Union Pacific-Wister, NW SW NE 13-22n-79w, dry at 2,183 ft.

Oregon Basin, Park County: Ohio Oil Co. 8 Lavender-OPC, NW SW SE 30-51n-100w, T.D. 4,077 ft., 5½-in. 4,021 ft., 125 bbl. per day, 15 per cent water, from the Embar.

Ohio Oil Co. 3 Ora Sonners-2, SE NE 8-51n-100w, T.D. 3,690 ft., 5½-in. 3,676 ft., top Embar 3,645 ft., 150 bbl. per day, 35 per cent water.

Texas Co. 6 Ora Sonners, NW SE NE 30-51n-100w, T.D. 3,431 ft., 8⅝-in. 3,415 ft., 200 bbl. per day on the pump.

Yale Petroleum Corp. 3 Hancock, NW NW NE 5-50n-100w, T.D. 3,557 ft., 8⅝-in. 3,556 ft., perf. 3,255-3,410 ft., top Embar 3,227 ft., Tensleep 3,464 ft., 350 bbl. per day on pump.

Sherrard, Carbon County: Sinclair-Wyoming Oil Co. 1 King, SE NE NE 31-25n-88w, dry, T.D. 3,170 ft., P.B. to 2,912 ft.

MONTANA COMPLETIONS

Cut Bank, Glacier County: M. R. Wagner 1 Pierce, C SW SE 32-36n-5w, dry, T.D. 2,951 ft., upper Sunburst 2,800-23 ft., show oil at bottom, lower Sunburst 2,880-85 ft., upper Cut Bank 2,922-51 ft., no lower Cut Bank.

Dunkirk, Toole County: Lucky Seven Oil Co. 1 Knutson, NE NE SW 5-31n-1e, lost hole and abandoned at 1,380 ft.

Kevin-Sunburst, Toole County: S. Victor Day 4 Halter, NW SE NE 17-35n-2w, T.D. 1,745 ft., Ellis-Madison 1,648-53 ft., P.B. to 1,680 ft., acid, 500 gal., pumping 60 bbl. per day.

TEXAS GULF COAST

Second Well Shows Oil In Katy Field

HOUSTON, Tex.—The second oil producer in the Katy area, long supposed to be a gas-condensate field only, promises to be Humble Oil & Refining Co. 1 Harry Hebert, 4,000 ft. east of Stanolind Oil & Gas Co. 1 Pattison, the surprise well which disclosed the oil sand. The Hebert test, in Waller County (the Katy field spreads into Harris County also), flowed at the rate of 93 bbl. daily through ⅛-in. choke from pay at 6,859-61 ft. in a test made last week. The Stanolind well is producing 153 bbl. of 45.3-gravity oil from perforations at 6,622-25 ft., and it is expected that further testing of the Humble well will be at that level. Various problems which have emerged from discovery of this oil sand in the Katy area are still under study by a committee of operators and officials of the PAW. It is understood that a program for development of the field will be announced soon. Humble has pits completed for 1 P. V. Cook, another wildcat test, 3½ miles northeast of the Katy field, in Harris County.

Jackson County.—W. Stewart Boyle and Sterling Oil & Refining Co. ran into mechanical trouble at their 1 Dr. M. D. Levy, which recently opened the Sterling field in the Hanado area. The crew was unable to cement split casing found at 3,500-03 ft., so set whipstock at 3,484 ft., cut a window in the casing at 3,483-96 ft., and at latest report was drilling at 4,470 ft. in a sidetracked hole. Tests at John B. Coffee et al 1 Mrs. Rose York, 3½ miles southeast of Ganado, showed oil and gas odors. The well was drilling ahead at 4,856 ft. in shale.

Matagorda County.—Superior Oil Co. of California 1 F. B. Peterson, in the Burnett & Sojourner Survey, after failing to recover a drilling bit, was preparing to set plug on bottom. The well was at 10,702 ft. in sand when drill pipe stuck. Continental Oil Co. 1 S. G. Anderson, 1½ miles southeast of Citrus Grove, was below 3,740 ft. in shale.

Harris County.—Cities Service Oil Co. 1 Witcher, 3 miles northeast of Alief, was drilling at 8,106 ft. in shale. A series of tests have shown gas odors. The well topped the Discorbis Yeguaensis at 7,500 ft., Eponides Yeguaensis 7,599 ft.

Brazoria County.—J. S. Abercrombie Co. and Magnolia Petroleum Co., which drilled their 1-B McDonald in the Old Ocean field to 14,378 ft., making it the deepest test in the state, have applied for permission to make a dual completion. The Railroad Commission heard the application April 15. The well was plugged back and a series of tests made.

Colorado County.—Magnolia 1 Anderson Brothers, 1½ miles southwest of Chesterville, was coring ahead from 6,822 ft. after a drill-stem test at 6,482-85 ft. in the Cockfield showed gas and distillate. It is planned to carry this test to the Wilcox, below 11,500 ft.

Wildcat operations.—New work started in Chambers County: Arkansas Fuel Oil Co. 1 Annie Frankland, R. C. Frankland Survey. Jackson County: John B. Coffee et al 1 J. L. York estate, 3 miles southeast of Ganado. Jefferson County: Sun Oil Co. 1 Wilson-Bordges, 3 miles north of Beaumont. Matagorda County: Stanolind 1 J. L. Pydus, G. W. Nexsen Survey.

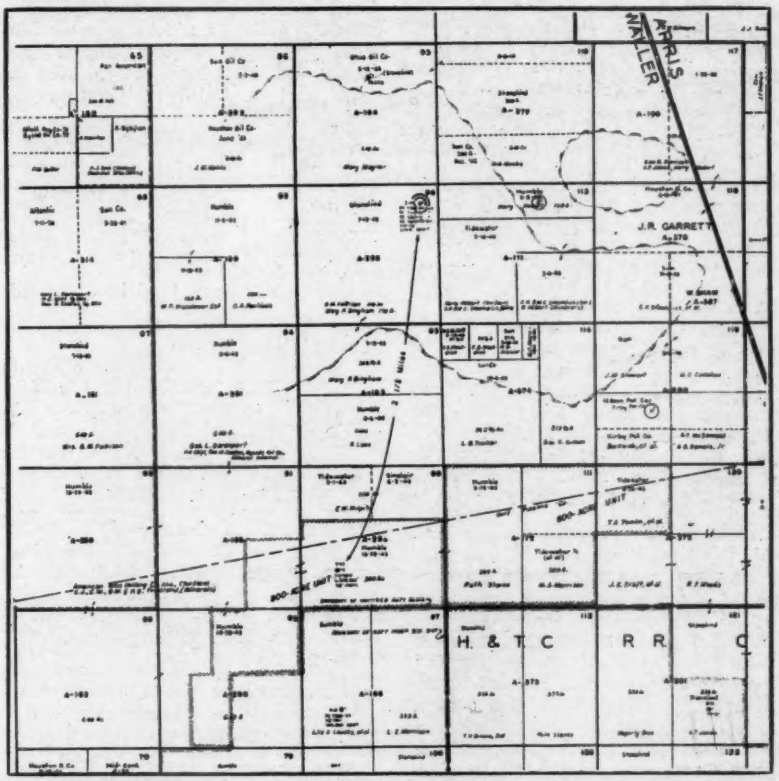
TEXAS GULF COAST COMPLETIONS

Fields

Clinton, Harris County: Sun 1 M. O. Furr, C. Martinez Sur., A-545, dry at 6,525 ft.

Clodine, Fort Bend County: Stanolind 1 Cinco Ranch Co., James Brock Sur., A-110, 86 bbl. through 6/64-in. choke, gas-oil ratio 662, perf. 7,497-98 ft., T.D. 7,502 ft.

Esperson, Liberty County: Atlantic 1 T. E. Davis estate, D. L. Kokernut Sur., A-60, dry at 10,505 ft.



Map of the Katy area of Waller and Harris counties, Texas, showing location of Humble Oil & Refining Co. 1 Harry Hebert and Stanolind Oil & Gas Co. 1 Pattison, which recently uncovered an excelent oil sand where it had been supposed gas and distilate only were to be found

Ganado, Jackson County: Texas 1 Otto C. Hultquist, 134 bbl. through ½-in. choke, T.P. 935 lb., gas-oil ratio 524, perf. 6,450-58 ft., T.D. 6,565 ft.

Nome, Jefferson County: Sun 7 E. Paggi estate, J. W. Kirby heirs estate, A-584, O.W.W.O., old T.D. 6,052 ft., cleaned and P.B. to 6,005 ft., 173 bbl. through 11/64-in. choke, T.P. 285 lb., gas-oil ratio 855, perf. 5,990-6,004 ft.

North Markham, Matagorda County: Ohio 17 J. C. Carlson, I.&G.N.R.R. Sur., A-337, 177 bbl. through ½-in. choke, T.P. 1,100 lb., gas-oil ratio 597, perf. 7,714-22 ft., also completed as gas well, with no gage, perf. 7,382-84 ft., C.P. 2,300 lb. through ½-in. choke, T.D. 8,087 ft.

CALIFORNIA

Two Gas Fields Found in Northern San Joaquin Valley

LOS ANGELES, Calif. — Two new gas fields were discovered in California last week and one of them may later show commercial production of crude oil.

The two new fields are at Mendota in Madera County where Texas Co. proved two gas zones, and at Lodi in San Joaquin County, where Amerada Petroleum Corp. developed production in 1 Lodi Community.

The Mendota field, in southern Madera County, is about 15 miles northwest of the Raisin City field in Fresno County. Texas Co. proved two gas zones productive in the discovery well, although the lower has been cemented off and only the top zone is being produced. This well was completed for 11,000,000 cu. ft. of natural gas per day from a gas pay of Eocene age with perforations at 4,415-25, 4,445-65 and 4,470-80 ft. The lower pay was developed in Cretaceous and produced 7,000,000 cu. ft. through a 12/64-in. bean with perforations at 5,745-60 ft. This zone showed producing pressure of 1,700 lb. and a shut-in pressure of 2,300 lb. and appears to be a zone of considerable importance.

Between the two gas zones, operator cored a soft, well-saturated oil sand at 4,527-62 ft. This oil sand, located in the top of the Eocene, tested wet, but the significant thing is that it may prove commercially productive at a higher structural location. Log of the well shows the first gas sand at 4,419-4,517 ft., a silt member at 4,517-27 ft., a soft, well-saturated oil sand in the interval at 4,527-62 ft., Cretaceous sand at 5,220-40 ft. and a gas sand at 5,745-60 ft. Top of the Eocene was 4,419 ft. and top of the upper Cretaceous was 5,100 ft. The lowest gas sand at 5,745-60 ft. is believed to be the equivalent of the Panoche sand of Upper Cretaceous age. The 20 ft. of Cretaceous sand at 5,220-40 ft. showed salt water at this location on a formation test with perforations open at 5,225-30 ft. and 5,240-50 ft. and was subsequently cemented off with a squeeze job.

Texas Co. in drilling the wildcat in the Mendota area made a thorough test of the specific location and carried the hole down to 9,154 ft. A string of 7-in. casing had been cemented at 7,967 ft. prior to the series of tests which were made by perforating the 7-in. at predetermined points.

Amerada Petroleum Corp. has concluded drilling operations on 1 Lodi community in 9-4n-7e at 4,471 ft. and has passed the well for production. This wildcat, with an 8⅝-in. water string cemented at 2,595 ft., discovered a new gas field in San Joaquin County about 18 miles northeast of the McDonald Island gas field and about 25 miles east of the prolific Rio Vista gas field. It is situated in the so-called delta region of the Sacramento Valley, a northern extension of the great San Joaquin Valley along which and in which are located a large part of California's major oil and gas fields.

The Amerada wildcat was carried down to the basement and plugged back to 2,270 ft. prior to completion and the water string perforated above this point. Initially, the well flowed at a daily rate of 7,500,000 cu. ft. of gas through a 1-in. bean. Plans are already under way to drill a second well to the west of the discovery. Three miles west and slightly north Bankline Oil Co. is redrilling its 1-1 Community in 1-4n-6e, and the outcome of drilling in this area should determine production possibilities and enable operators to do some satisfactory correlating.

Bankline's next wildcat in this area will be in 5-4n-7e, a short distance north of Amerada's present wildcat work. The only disconcerting factor in connection with Amerada's discovery is the fact that the natural gas is substantially below the average B.t.u. value, running around 775 units per cubic foot.

SAN JOAQUIN VALLEY COMPLETIONS

Antelope Hills, Kern County: Shell Oil Co. 76-6 Williams, 6-28s-20e, flowed 320 bbl., 17.1-gravity, 3 per cent cut, 24/64-in. bean, pressures 110/310 lb., T.D. 2,500 ft., 100-mesh perf. 2,335-2,495 ft., completed in 11-B Williams zone, Miocene.

Belridge, North, Kern County: Belridge Oil Co. 27-27-Y fee, 27-27s-20e, flowed 207 bbl., 31.9-gravity, 0.4 per cent cut, 750,000 cu. ft. gas, 16/64-in. bean, pressures 400/1,750 lb., top Temblor of Miocene age 5,156 ft., T.D. 8,940 ft., perf. 8,831-8,940 ft., completed in Y zone, Eocene.

Belridge, South, Kern County: General Petroleum Corp., 23-2 fee, 2-29s-21e, pumped 68 bbl., 16.9-gravity, 6 per cent cut, T.D. 894 ft., perf. 520-641 ft., 681-751 ft., 800-75 ft., completed in Belridge zone, Pleistocene.

General Petroleum Corp. 34-12 Belridge, 12-29s-21e, pumped 62 bbl., 13.4-gravity, 20 per cent cut, T.D. 1,080 ft., perf. 687-1,059 ft., completed in Belridge zone, Pleistocene.

Ohio Oil Co. 17 Hopkins fee, 4-29s-21e, pumped 25 bbl., 14.1-gravity, 75 per cent cut, T.D. 783 ft., perf. 678-782 ft., completed in Belridge zone, Pleistocene.

Bowerbank gas field, Kern County: Texas Co. 6-C Bowerbank, 6-29s-24e, abandoned, T.D. 4,950 ft.

Coalinga, East, Fresno County: Shell Oil Co. pumped 180 bbl., 19.5-gravity, 5 per cent cut, T.D. 3,632 ft., perf. 3,286-3,426 ft., 3,446-81 ft., 3,501-31 ft., 3,562-3,630 ft., completed in East Coalinga zone, Miocene.

Coalinga, West, Fresno County: General Petroleum Corp. 111 Esperanza, 6-20s-15e, pumped 47 bbl., 14.2-gravity, 35 per cent cut, T.D. 1,759 ft., perf. 1,626-1,758 ft., completed in West Coalinga zone, Pliocene.

Texas Co. 6-C fee, 6-20s-15e, pumped 60 bbl. net, 17-gravity, 40 per cent cut, T.D. 2,332 ft., perf. 2,271-2,32 ft., completed in West Coalinga zone, Pliocene.

Friant Dome wildcat district, Fresno County: D. M. Gay 1 Friant Dome, 30-11s-21e, abandoned, T.D. 115 ft.

Greeley, Kern County: Standard Oil Co. 11-36 Kern County Land, 20-29s-26e, flowed 943 bbl., 38.3-gravity, 3 per cent cut, 1,300,000 cu. ft. gas, 16/64-in. bean, flow pressure 1,300/1,050 lb., S.I. pressure 1,300/1,270 lb., T.D. 11,514 ft., 60-mesh perf. 11,451-11,513 ft., completed in Rio Bravo zone, 11,450 ft., and Vedder zone, 11,506 ft., both Miocene.

Kern Front, Kern County: General Petroleum Corp. 13 Young, 14-28s-27e, pumped 52 bbl. net, 14.4-gravity, 18 per cent cut, T.D. 2,076 ft., perf. 1,989-2,076 ft., complete in Kern Front zone of Pliocene.

Standard Oil Co. 18-5 fee, 5-28s-27e, pumped 80 bbl. net, 14.8-gravity, 36 per cent cut, T.D. 2,800 ft., 100-mesh perf. 2,608-2,798 ft., completed in Kern Front zone, Pliocene.

Standard Oil Co. 38-15 fee, 15-28s-27e, pumped 94 bbl., net, 14.1-gravity, 35 per cent cut, T.D. 2,290 ft., 100-mesh perf. 2,155-2,288 ft., M point 1,892 ft., N point 1,999 ft., R point 2,099 ft., S point 2,130 ft., completed in Kern Front zone, Pliocene.

Mendota gas field, Madera County: Texas Co. 38-16 Gill, 16-13s-16e, flowed 10,000,000 cu. ft. gas, no oil, 1-in. bean, pressures 1,725/1,725 lb., T.D. 9,154 ft., perf. 4,415-25 ft., 4,445-65 ft., 4,470-80 ft., Cretaceous gas sand 5,745-60 ft., showed commercial possibilities, oil sand 4,562 ft. tested wet; completed in Gill zone, Eocene.

Midway-Sunset, Kern County: H. & T. Oil Co. 8 Midway-Sunset, 15-31s-22e, pumped 55 bbl. net, 13.1-gravity, 25 per cent cut, T.D. 1,132 ft., P.B. 1,095 ft., perf. 671-1,095 ft., completed in Midway zone, Pliocene.

Standard Oil Co. 5-29-D fee, 29-32s-24e, pumped 45 bbl. net, 25.8-gravity, 27 per cent cut, T.D. 3,048 ft., P.B. 2,350 ft., 60-mesh perf. 2,295-2,345 ft., completed in Midway zone, Pliocene.

Union Oil Co. 4 Midway Northern, 7-11n-23e, pumped 280 bbl., 11.7-gravity, 3 per cent cut, T.D. 1,862 ft., 180-mesh perf. 1,742-1,862 ft., completed in Midway zone of Pliocene.

Mount Poso, Kern County: Ring Oil Co. 16-29 Bowles, 29-28s-28e, pumped 96 bbl., 14.1-gravity, 5 per cent cut, T.D. 1,699 ft., perf. 1,677-98 ft., completed in Vedder zone, Miocene.

Rio Vista gas field, Solano County: Amerada Petroleum Corp. 2 Kuhn Community, 28-4s-3e, S.I. without making flow test, T.D. 4,300 ft., gun perf. 4,070-4,110 ft., 4,125-4,230 ft., 4,250-70 ft., S.I. pressures 1,620/1,620 lb., green sand 4,070 ft., completed in Emigh sand, Eocene.

Round Mountain, Kern County: Honolulu Oil Corp., 53 Round Mountain, 18-26s-29e, pumped 49 bbl., 16.4-gravity, 2 per cent cut, T.D. 2,083 ft., P.B. 2,005 ft., 100-mesh perf. 1,947-2,004 ft., completed in Vedder zone, Miocene.

Strand, East, Kern County: Tide Water Associated Oil Co. 32-17 Kern County Land, 17-30s-26e, abandoned as unproductive, T.D. 8,460 ft., N point 7,842 ft., very thin stringers of oil sand 8,208-40 ft. but no solid sand body, bottomed in gray sand.

(Continued on Page 175)

ILLINOIS

Dry Holes Outnumber New Crop of Oil Wells

MATTOON, Ill.—The first water-flooding operation in the Illinois basin fields will be started by the Adams Oil & Gas Co. in the Patoka field in Marion County, which field that company opened in 1936. Permits have been obtained to drill five wells to the Benoist sand on the Merryman lease in the SW 21-4n-1e, A five-spot pattern will be used.

Thirty-four new operations were reported in Illinois including five wildcats: A. F. Dye 1 Schernekaw, C W½ SW SW 18-1n-14w, Edwards County, location; Ryan Oil 1 Joe Besch, SW SE SE 30-3s-14w, Edwards County, derrick; Eslick et al 1 Velde, SE NE SE 13-1n-9e, Clay County; Cameron Brothers, Inc., 1 Seibert, SE SE NW 33-5n-3e, Fayette County, moving in material; Seaboard 1 Eldridge, NE SE NE 3-4s-3e, Jefferson County.

Production of Illinois in March is estimated at 7,342,000 bbl. by the state Geological Survey, a daily average of 237,000 bbl., a decline of 3,000 bbl. per day from the estimated average for the months of January and February.

Twenty of the 33 completed wells reported in the past week were dry.

ILLINOIS COMPLETIONS

Wildcats

Franklin County: E. Adkins 1 Brown et al, SE NE NW 25-7s-2e, which originally pumped 122 bbl., T.D. 2,975 ft., worked over and acidized, pumped 120 bbl., lower O'Hara topped at 2,748 ft.

Gallatin County: W. C. McBride, Inc., 1 Shan-Hise, SE NW SE 21-8s-9e, dry at 2,898 ft., Benoist 2,658 ft., Renault 2,736 ft., Aux Vases 2,814 ft., Ste. Genevieve 2,839 ft.

Henderson County: C. D. Kidder 1 Carpenter, SE NE NE 8-8n-5w, fourth principal meridian, dry 530 ft., Kinderhook at 56 ft., Devonian 401 ft.

Marion County: Cameron Bros. 1 Binnion, SW NW SW 2-4n-1e, dry 1,770 ft., Glen Dean 1,330 ft., Golconda 1,383 ft., Barlow 1,463-86 ft., Weiler 1,520-54 ft., Paint Creek 1,619 ft., Benoist 1,682-1,715 ft., Aux Vases 1,719-64 ft., Ste. Genevieve 1,764 ft.

St. Clair County: G. A. Morris 1 Englerth, SW SW NE 31-1s-8w, dry 274 ft., Cypress at 274 ft., Paint Creek at 142 ft., Benoist 190 ft., Aux Vases 255 ft.

Washington County: Texas 1 Herman, SE SW NW 33-2s-4w, dry at 1,425 ft., Barlow lime 919 ft., Weiler 946-1,002 ft., Benoist 1,060 ft. and 1,084-1,132 ft., Renault 1,132-42 ft., Aux Vases 1,142-54 ft., lower O'Hara 1,304-06 ft., McClosky 1,334-42 ft. and 1,377-88 ft., St. Louis 1,352 ft.

Harry Schwarz 1 Pytlenski, NE NW NW 13-3s-2w, dry 1,376 ft., Benoist 1,366 ft., showed water on drill-stem test.

Wayne County: Gulf 1 Gladys, NE NE SW 26-2n-6e, dry in St. Louis lime, T.D. 3,235-40 ft.

Fields

Bible Grove, Clay County: Texas 6 Bloenker, SE SW NW 3-5n-7e, pumped 101 bbl., T.D. 2,538 ft., Weiler sand 2,498-2,505 ft., 2,523-36 ft.

Cordes, Washington County: Magnolia 11 Gill, NW SW NE 26-3s-3w, pumped 28 bbl. oil, 8 bbl. water, shot at 1,281-85 ft., Benoist sand.

Dupo, St. Clair County: Tarlton Oil 1-A Dyroff, NE SE SE 28-1n-10w, dry at 1,800 ft.

Iola, Clay County: Texas 1 Joliff, NE NE SE 16-5n-5e, dry at 2,385 ft., shot at 2,368-74 ft., show of oil and water.

Texas 2 Risser, NE NW SE 15-5n-5e, pumped 100 bbl. from Aux Vases sand at 2,338-46 ft.

Shell 1 Buhrman, NE NW SW 15-5n-5e, dry at 2,406 ft.

Friendsville, Wabash County: Cities Service 1 Foster, SE SE SE 3-1s-13w, dry, 2,470 ft., P.B. and tested at 2,330 and 2,320 ft.

King, Jefferson County: Nash & Redwine 6 Randolph, NE SW SW 27-3s-3e, pumped 165 bbl., shot at 2,725-40 ft., Aux Vases sand 2,713-40 ft.

Nash & Redwine 1 Prudential, SW SE SW 27-3s-3e, dry, 4,759½ ft.

Louden, Fayette County: Carter 5 Doty, SW cor. SE NW 2-8n-3e, pumped 97 bbl. oil and 30 bbl. water from Devonian lime at 3,042 ft., T.D. 3,131 ft.

South Maunie, White County: Fred Capshaw 1 Barnes, NW NW NE 13-6s-10e, dry at 2,871 ft.

New Harmony-Phillipstown area, White County: Jarvis Bros. 1 Fitzgerald, SW NW NW 31-4s-14w, dry at 2,390 ft.

North Calvin, White County: Jarvis & Marcell 5 Garner, SE NE NE 31-4s-11e, old T.D. 2,436 ft., P.B. to 1,544 ft., Penn sand 1,469-1,500 ft., perforations at 1,469-70 ft., pumped 80 bbl. oil, 65 bbl. water.

Rural Hill, Hamilton County: Texas 1 Dial, NW NE SW 7-6s-6e, pumped 40 bbl. oil and 5 bbl. water in 12 hr., shot twice at 3,137-42 ft., Aux Vases sand 3,123-31 ft., old T.D. 3,334 ft., P.B. to 3,144 ft.

(Continued on Page 155)

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SOUTHWEST TEXAS

New Pool Brought in North Of Rio Grande City

CORPUS CHRISTI, Tex. — Ike Howeth's Starr County wildcat, 1 E. P. Caffarelli, 10½ miles north of Rio Grande City, has been completed, flowing 77 bbl. of 47.6-gravity oil through ⅛-in. choke from pay at 3,609-20 ft. The discovery is on land farmed out by Humble Oil & Refining Co. which with Lockhart Oil Co., and F. D. Davenport hold most of the surrounding acreage. A mile and a half southeast of the strike, Davenport and Lockhart have staked location for 2 Domingo L. Garza. Another new location in the same general area is Baldridge & King 1 Mary H. Edgerton, about 3 miles southeast of the Caffarelli. High prices are being paid for leases.

Notwithstanding negative results of tests in the 4,500-ft. level, belief continues that T. E. Stephens 1 Gonzales heirs, 10 miles north of Roma, in Starr County, may open a pool. After being bottomed at 5,378 ft. the well has been killed and plugged back to 4,263 ft. There has been a marked renewal of wildcatting activity in the Rio Grande Valley. Sun Oil Co. plans to drill an 11,500-ft. test in the Sun field of Starr County. Originally Sun filed notice of intention to drill to 9,500 ft.

Karnes County.—Brisk lease trading has followed the opening of the shallow Hobson field by Seaboard Oil Co. 1 Julia Rzeppa. Seaboard's second well, 1 R. F. Fertsch, has been completed with initial production of 146 bbl. through 5/32-in. choke from perforations at 4,021-24 ft., and the same company has derrick built for 1 E. Plueckhahn, a southwestern offset 1,850 ft. from the Fertsch. Phillips Petroleum Co. which with Adams Oil & Gas Co., opened the Hondo Creek field last month with the 1 Reasoner, 5 miles southeast of Kenedy, has staked location for 1 George T. Beaham, an offset 1,320 ft. south of the discovery.

La Salle County.—Quintana Petroleum Co. 1-D South Texas Syndicate, 14 miles south of Fowlerton, bottomed at 7,130 ft., was testing sand at 6,030-55 ft. It tested gas through ⅛-in. choke, with tubing pressure of 2,100 lb.

SOUTH TEXAS COMPLETIONS

Wildcats

Duval County: H. J. Porter et al 2-A J. Dunn, 8 mi. E of Cole field, dry at 4,104 ft.

Stanolind 1 C. Driscoll, 5 mi. NW of Fitzsimmons, dry at 5,259 ft.

Lee County: Superior 1 P. Domann, L. P. Rucker Sur., dry at 3,518 ft.

Starr County: I. K. Howeth et al 1 E. P. Caffarelli, 10½ mi. N of Rio Grande City, 77 bbl. through ⅛-in. choke, T.P. 200 lb., S.I. C.P. 900 lb., perf. 3,609-20 ft., T.D. 3,626 ft.

Sun 1-A F. Alvarado, 3½ mi. NE of Rincon field, dry at 7,081 ft.

Webb County: M. L. Massingwell 1 Watkins ranch, 5 mi. SW of Adami field, dry at 953 ft.

Fields

Gutierrez, Jim Hogg County: M. L. Massingwell 1 E. L. Armstrong, A. Villa Sur. 90, A-333, dry at 3,664 ft.

LOWER GULF COAST COMPLETIONS

Wildcat

Hidalgo County: Sun 1 D. D. Oil Co., 2½ mi. NW of Gateway, dry at 7,520 ft.

Fields

Armagosa, Jim Wells County: Smith & Story 5 J. C. McGill, 9,000,000 cu. ft. gas open flow, perf. 2,724-28 ft., T.D. 2,750 ft.

Bentonville, Nueces County: Abbott & Traxler 1 Rand Morgan, Richard King farm lots, dry at 5,830 ft.

Southern Minerals Corp. 3-C Richard King, Agua Dulce grant, 178 bbl. through ⅛-in. choke, T.P. 740 lb., C.P. 1,275 lb., gas-oil ratio 726, perf. 5,578-83 ft., T.D. 5,590 ft.

Hobson, Karnes County: Seaboard 1 R. F. Fertsch, E. Seguin Sur., A-10, 146 bbl. through 5/32-in. choke, T.P. 465 lb., C.P. 775 lb., gas-oil ratio 102, perf. 4,021-24 ft., T.D. 4,032 ft.

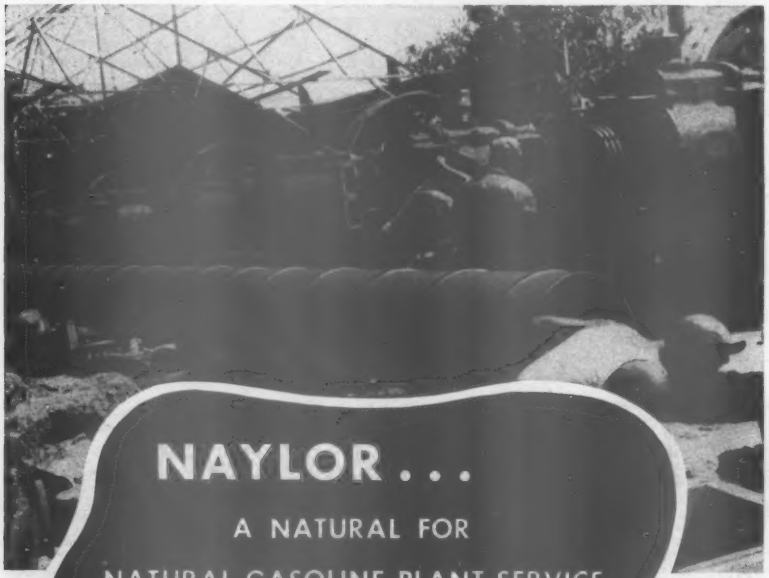
Odem, San Patricio County: Seaboard 4 R. R. Ellis, Julian de la Garza Sur., A-8, 114 bbl. through ⅛-in. choke, T.P. 650 lb., C.P. 575 lb., gas-oil ratio 351, perf. 5,442-50 ft., T.D. 5,453 ft.

Seaboard 7-B J. F. Welder, Julian de la Garza Sur., A-8, 131 bbl. through ⅛-in. choke, T.P. 625 lb., C.P. 825 lb., gas-oil ratio 359, T.D. 6,817 ft.

Plymouth, San Patricio County: Plymouth Oil Co. 52-C E. H. Welder, O.W.D.D., old T.D. 5,501 ft., new T.D. 5,648 ft., 80 bbl. through 7/64-in. choke, T.P. 450 lb., S.I. C.P. 350 lb.

Rooke, San Patricio County: Plymouth Oil Co. 4-E E. H. Welder, T. T. Williamson Sur., 42 bbl. through 3/32-in. choke,

(Continued on Page 157)



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PERMIAN BASIN, PANHANDLE

Plan Deepening Fullerton Outpost to Ellenburger

MIDLAND, Tex.—Magnolia Petroleum Co. 1 B. B. Ralph, 467 ft. from north and east lines of Section 20, Block A-38, Public School Land, in western Andrews County, 8 miles west by south of the Fullerton pool, will be deepened to 8,000 ft. The well was drilled to 6,434 ft. in July 1941, and lacked but about 500 ft. of reaching the depth from which the Clear Fork lime produces in the Fullerton pool. In deepening to 8,000 ft. the Ellenburger lime, producing in the Embar pool, 20 miles to the southwest, should be reached. Skelly Oil Co. 1-K University, SW SW Section 28, Block 9, University Survey, 2 miles east of the Emma pool, topped San Andres lime at 4,434 ft., drilled to 4,876 ft. where returns were lost, and mud was being mixed.

Crockett County.—A north extension for the Noelke pool seemed assured as Shell 1 State, Section 71, Block GG, topped the Soma sand with show of oil at 1,383 ft. and was testing after setting pipe at that depth.

Pecos County.—Choate & Brown 1-15 University, NW NW Section 15, Block 20, University Survey was flowing an estimated 3,000,000 cu. ft. of gas daily from Yates gas sand topped at 830 ft. while drilling ahead below 1,000 ft. Brown & Hancock 1 McKay, Section 32, Block 1, I.&G.N. Survey, in the east corner of the county, was drilling below 2,165 ft. in lime. The Heiner pool outpost, Culbertson & Irwin 1 R. G. Heiner, in Section 589, G.C.&S.F. Survey, a deep test, had drilled past 3,040 ft. Magnolia 1-29 Eaton, Section 29, Block 3, H.&T.C. Survey, at total depth 8,224 ft., recovered 25 ft. of mud on drillstem test, and was coring ahead. Sulfur water had been tested in cores from 8,212-24 ft. Standard Oil Co. of Texas 1 Douglas Oil, Section 9, Block 194, on the west edge of Yates pool, was drilling below 5,860 ft.

Ward County.—Shell 3 Sealy-Smith, Section 38, Block A, G.&M.M.B.&A. Survey, Monahans pool, total depth 5,817 ft., swabbed 2.8 bbl. water in 1½ hours with packer at 5,607 ft.

Winkler County.—Amon G. Carter et al C-2 Walton, new Ellenburger pool opener in the Keystone area, made 19 bbl. distillate in 40 minutes with 21,000,000 cu. ft. of gas from 9,370 to 9,405 ft. and was coring ahead below 9,411 ft. Magnolia 20 State-Walton, Section 4, Block B-3, Public School Land, was bottomed at 10,430 ft. in lime and shale, preparing to core ahead.

Yoakum County.—Humble 1 Tannehill Brothers, Section 840, Block D, J. H. Gibson Survey, was fishing for cone at 5,875 ft.

WEST TEXAS COMPLETIONS

Wildcats

Hockley County: George P. Livermore, Inc., 1 G. C. Thomas, 660 ft. from N and W Blk. 29, Lge. 10, Donley County School Land, elev. 3,348 ft., brown lime 3,690 ft., San Andres lime 4,040 ft., dry, T.D. 5,516 ft.

Menard County: A. G. Talbot 1 Willie Wilkinson, 680 ft. from S and W, Sec. 55, J. H. Gibson Sur., elev. 2,178 ft., Ellenburger 3,300-3,466 ft., show gas 3,355-85 ft., dry, T.D. 3,466 ft.

Fields

Iatan-East Howard, Howard County: Fleming Oil 3 Percy Jones, 350 ft. from S, 1,650 ft. from E, Sec. 15, Blk. 30, Twp. 1s, T.&P.R.R. Survey, elev. 2,448 ft., I.P. 196 bbl., pay 2,555 ft., shot 925 qt., T.D. 2,889 ft.

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Noelke, Crockett County: A. J. Rife 1 Bouscaren heirs, 330 ft. from N and E, Sec. 57, Blk. GG, flowed 286 bbl., pay 1,165 ft., shot 60 qt., T.D. 1,181 ft., sand.

South Cowden, Ector County: Sunray Oil 6 J. E. Bagley, NW NE SW Sec. 17, Blk. 42, Twp. 2s, T.&P.R.R. Sur., elev. 2,950 ft., flowed 530 bbl., pay 4,250 ft., lime, shot 460 qt., T.D. 4,390 ft.

Slaughter, Cochran County: Bay Pet. 3 Mallet, 580 ft. from N and W, Lab. 1, Lge. 53, Scurry County School Land, elev. 3,643 ft., pumped 166 bbl., pay 5,038 ft., perf. 5,035-45 ft., acid 9,000 gal., T.D. 5,083 ft.

J. C. Hawkins 44-A Mallet, 580 ft. from S and E Lab. 15, Lge. 47, Edwards County School Land, flowed 384 bbl., pay 4,895 ft., acid 11,500 gal., T.D. 4,943 ft., lime.

Slaughter, Hockley County: E. Constantin and associates 3 W. C. Elliott, 1,320 ft. from S, 440 ft. from W, Lab. 10, Lge. 42, Rains County School Land, elev. 3,578 ft., flowed 593 bbl., pay 4,912 ft., lime, acid, T.D. 4,940 ft.

J. C. Hawkins 13-A Mallet, 580 ft. from N and E, Lab. 23, Lge. 47, Edwards County School Land, flowed 456 bbl., pay 4,934 ft., lime, acid 11,500 gal., T.D. 4,978 ft.

J. C. Hawkins 31-A Mallet, 580 ft. from S and W, Lab. 18, Lge. 47, Edwards County School Land, flowed 505 bbl., pay 4,921-54 ft., acid 11,500 gal., T.D. 4,957 ft.

J. C. Hawkins 49-A Mallet, 580 ft. from S and E, Lab. 14, Lge. 47, Edwards County School Land, elev. 3,639 ft., flowed 304 bbl., pay 4,886 ft., acid. 10,000 gal., T.D. 4,938 ft.

J. C. Hawkins 14-B Mallet, 580 ft. from S and E, Lab. 23, Lge. 46, Edwards County School Land, elev. 3,638 ft., San Andres 4,040 ft., I.P. 96 bbl., pay 4,850-4,900 ft., acid 10,000 gal., T.D. 4,929 ft.

Wasson, Gaines County: Continental 6-52 Wasson, 2,310 ft. from W, 660 ft. from S, Sec. 52, Blk. AX, Public School Land, I.P. 194 bbl., pay 4,904 ft., acid 4,000 gal., T.D. 4,963 ft.

Mabee Oil & Gas 3-40 N. W. Willard, 1,980 ft. from N, 510 ft. from W, Sec. 40, Blk. AX, Public School Land, elev. 3,533 ft., dry, T.D. 5,270 ft.

Wasson, Yoakum County: Devonian 2 Ruth Bennett, SE NE Sec. 631, Blk. D, J. H. Gibson Sur., flowed 673 bbl., pay 5,147 ft., acid 11,000 gal., T.D. 5,270 ft.

Old Well Drilled Deeper

South Ward, Ward County: Texas Pacific Coal & Oil 24 Henry James, 1,980 ft. from SE, 1,650 ft. from SW Sec. 5, Blk. 34, H.&T.C. Sur., old T.D. 2,290 ft., new T.D. 2,687 ft.

SOUTHEAST NEW MEXICO

HOBBS, N. M.—R. Olsen and Atlantic Refining Co. 1 Langlie, 11-25s-37e, Lea County, perforated with 80 shots, 71 effective, from 9,910-80 ft., recovered 270 ft. gas-cut mud plus 3,000 ft. water blanket with oil emulsion. Operators reperforated with 123 shots from 9,110 to 9,200 ft., ran 2-in. tubing to 9,188 ft., set packer at 9,091 ft., acidized with 5,000 gal., swabbed down to 3,000 ft. off bottom, and were unable to lower the fluid column, receiving 11 bbl. of water per hour with no oil. It was thought the perforations were too low, and it is planned to squeeze them off and reperforate above.

A new wildcat for Lea County is C. T. McLaughlin 1 Shell-State, NW NE 7-17s-33e, 3 miles northeast of the Maljamar pool.

COMPLETIONS

Wildcats

Lea County: Van S. Welch 1 Ayers-State, SE SE 36-20s-32e, sulfur water, dry, T.D. 3,439 ft.

Otero County: Hunt Oil 1 McMillen & Turner, SW SE 5-26s-16e, Yeso 265 ft., granite wash 2,080 ft., dry, granite at T.D. 2,175 ft.

Fields

Maljamar, Lea County: Fair & Pope 2-A Johns, NW NE 26-17s-30e, flowed 615 bbl., pay 4,130 ft., shot 240 qt., 4,022-4,140 ft., T.D. 4,175 ft.

Square Lake, Eddy County: O. H. Randel 1 State, SE NW 2-17s-32e, flowed 60 bbl., pay 2,943-95 ft., shot 180 qt., T.D. 3,045 ft.

Old Well Drilled Deeper

Loco Hills, Eddy County: George Williams 1 F. E. Miller, NW NW NW 6-18s-28e, old T.D. 2,800 ft., dry, new T.D. 3,300 ft.

PANHANDLE COMPLETIONS

Gray County: Wilcox Oil & Gas 39 Worley-Reynolds, 1,650 ft. from S, 990 ft. from W, Sec. 61, Blk. 3, I.&G.N. Sur., elev. 3,084 ft., I.P. 4,000,000 cu. ft. gas, pay 3,045-3,165 ft., P.B. to 3,165 ft. from T.D. 3,220 ft.

Hutchinson County: J. E. Crosby, Inc., 55 Pitts, 1,580 ft. from N, 4,950 ft. from E, L. Pitts lease, Sec. 9, Blk. M-21, T.C.R.R. Sur., elev. 2,848 ft., pumped 124 bbl., pay 2,758 ft., T.D. 2,848 ft.

J. M. Huber Corp. 4 State of Texas, 1,350 ft. W, 575 ft. N of NE cor. Sec. 79, Blk. 46, H.&T.C. Sur., elev. 2,802 ft., I.P. 50.4 bbl., pay 2,682 ft., T.D. 2,700 ft.

J. M. Huber Corp. 27 Weatherly, 555 ft. from S and E of SW¼ Sec. 26, Blk. Y, A.B.&M. Sur., elev. 3,109 ft., I.P. 95 bbl. gas lift, pay 2,995 ft., T.D. 3,073 ft.

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OKLAHOMA

Three New Pools Are Opened by Wildcats

OKLAHOMA had a good week with new pools opened in Oklahoma, Osage and Hughes counties. A large lime well was also completed in the West Loco sand area of Stephens County.

Osage County.—A. G. Oliphant and Charles B. Peters, both of Tulsa, opened a new pool in an undrilled area at their 1 Osage, NE NE SW 20-25n-3e. Drilled to 3,852 ft. in Mississippi lime, the well was plugged back to test showings found in the Layton sand at 2,850-75 ft. Casing was set at 2,850 ft. and the well headed and made an estimated flow of 100 bbl. of oil the first hour, after which it was choked in to 10 bbl. an hour until pipe connections are made. Location is about 6 miles southeast of Ponca City and in an untested area that will open up a large field for further drilling. The nearest major production is the East Watchorn pool, 12 miles to the south.

Hughes County.—About midway between the Allen and Sasakwa pools, Bradley Brothers 1 Hall, NW NW 28-6n-8e, flowed 25 bbl. of oil a day in a shallow sand at 813-53 ft. Total depth was 1,325 ft.

Oklahoma County.—Four miles west of the Edmond pool, Ace Gutowsky and D. D. Bourland 1 Wagner, NW NW SW 32-14n-4w, was reported to have flowed over the derrick while cleaning out after perforating casing in Hunton lime. The lime was topped at 6,877 ft. and shots placed at 6,952-57 ft. The flow of oil was estimated to be from 50-75 bbl. an hour with some 5,000,000 cu. ft. of gas a day. Total depth of the well is 7,690 ft., in second Wilcox sand which was dry. It is shut in for storage.

Comanche County.—The Texas Co. 1 Spencer, NW NW 8-3n-10w, in the Elgin gas area, headed and flowed 90 bbl. of 36-gravity oil a day, by heads, in a shallow sand. Drilled to 1,102 ft., the well showed salt water and some gas and was plugged back to 822 ft. and perforations made from 790-812 ft. The 1 Spencer is ½ mile west of the same company's 1 Cline, recently completed for 4 million cubic feet of gas at 1,020-40 ft.

Coal County.—Stanolind and Amerada 1 Cushing Royalty, NW NE SE 22-3n-9e, which previously had gaged considerable gas in the Cromwell zone below 3,500 ft., showed 500 ft. of salt water on the drill-stem test at 4,240 ft.

OKLAHOMA COMPLETIONS

Wildcats

Cleveland County: T. N. Law et al 1 Coley, NW SE 10-10n-1e, dry, T.D. 6,300 ft., Oswego 5,435 ft., Hunton 5,765 ft., Viola 6,095 ft., Wilcox 6,260 ft., second Wilcox 6,377 ft.

Hughes County: Bradley Bros. 1 Hall, NW NW 28-6n-8e, flowed 25 bbl., sand 813-53 ft., T.D. 1,325 ft.

Crum & Bartlett 1 Craig, SW NW SE 4-6n-8e, dry, T.D. 3,289 ft. in Cromwell sand.

Stephens County: Helmerich & Payne 1 Cleghorn, NE NE NE 25-2n-6w, dry, T.D. 6,241 ft., sand 5,825 ft., 5,847 ft., broken sand and lime 6,035 ft.

Fields

Ardmore, Carter County: Samedan 2-A Joliff, W½ NE NW 24-5s-1e, dry, T.D. 5,385 ft., sand 4,965 ft.

Crescent, Logan County: Sunray 1 Wells, SW SW NW 26-17n-4w, flowed 245 bbl. in 18 hr., sand 4,964-82 ft.

Cumberland, Marshall County: Pure 6 Little-101, SE NW SW 28-5s-7e, flowed 74 bbl. in 4 hr., sand 5,926 ft., T.D. 6,032 ft.

Glenn Pool, Creek County: Gulf 39 Pitman, NE NW SW 8-17n-12e, repressure well, T.D. 1,576 ft.

Gulf 33 Berryhill, SE SW 9-17n-12e, pumped 1 bbl., T.D. 1,556 ft.

Gulf 37 Berryhill, NW SE SE 9-17n-12e, repressure well, T.D. 1,580 ft.

Lake Shawnee, Pottawatomie County: J. E. Crosbie 1 Arrington, NE SE 29-10n-2e, dry, T.D. 6,040 ft., Wilcox 6,029 ft.

Fair Operating 6-A Baker, SE SE NE 35-2s-6w, flowed 237 bbl., lime 1,688-1,780 ft.

East Watchorn, Pawnee County: Phillips 2 Oldham, SW NW SW 24-23n-3e, flowed 254 bbl., Wilcox 3,837-47 ft.

Miscellaneous

Carter County: Louis Sikes 1 Adams, NW NW 6-1s-3w, dry, T.D. 4,322 ft.

Creek County: Texas 5 Hood, SW NW 7-14n-7e, 7,775,000 cu. ft. gas, sand 1,210-25 ft., T.D. 1,285 ft.

Haskell County: L. S. Grimm 1 Davis, NE NW 10-9n-18e, 250,000 cu. ft. gas, 1,170-1,310 ft., T.D. 1,320 ft.

Pittsburg County: M. M. Scheue 1 Lalman, NE SW NW 6-6n-16e, 1,400,000 cu. ft. gas, sand 1,954-2,200 ft., T.D. 2,245 ft.

Tulsa County: Johnson Oil & Ref. Co. 5 Holmes-Bailey, N½ SW NE 31-19-10e, dry, T.D. 2,943 ft.

Illinois Fields

(Continued from Page 151)

Gulf 2 Lockwood, NW SE SE 15-6s-5e, dry, T.D. 3,415 ft., McClosky lime 3,320-28 ft.

Southeast Golden Gate, Wayne County: Cities Service 1 Boggs, NW NW NE 32-2s-9e, dry 3,380 ft., Benoist sand 3,069 ft., Aux Vases 3,180 ft., Ste. Genevieve 3,228 ft., McClosky 3,274-77 ft., St. Louis 3,378-80 ft.

South Mason, Effingham County: Luttrell 3 See Est., SE NW NE 34-6n-5e, pumped 39 bbl. oil and 10 bbl. water, Benoist sand 2,267 ft., Aux Vases 2,335 ft., T.D. 2,372 ft.

W. R. Brown 1 Trimble, NW NW SW 26-6n-5e, pumped 65 bbl. oil, Rosiclare pay 2,433-38 ft., T.D. 2,441 ft.

South Lawrence, Lawrence County: Smith & Nye 2 Spidell Consolidated, SW NE SE 23-2n-12w, 240 bbl. from Biehl sand at 1,352-85 ft.

W. E. Baller 2 Hershey, NW cor. SE SW 26-2n-12w, dry at 1,430 ft., showing of oil at 1,400 ft.

Stokes-Iron area, White County: Carter 1-A Austin, NW NW SW 17-6s-9e, pumped 33 bbl., Benoist sand 2,770-79 ft., shot at 2,776-86 ft.

Woodlawn, Jefferson County: Duncan & Obering 1 Ragan, NW NE SW 25-2s-1e, pumped 30 bbl., Benoist sand 2,010-15 ft., T.D.

Wabash County: C. Knupp 1 Sturgeon, NW NE NE 12-1n-12w, dry at 1,435 ft.

What's New IN SAFETY

NEWS ABOUT SAFETY EQUIPMENT AND METHODS

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"Our men are very well pleased," said the safety engineer of one of the West Coast's largest shipyards, "with the Morenci Safety Belts we have given them to wear on scaffold jobs. They have repeatedly commented on their light weight and easy adjustability, which, from my point of view makes them completely successful."

Cylindrical kits

Manufacture and distribution of Bullard Cylindrical first aid kits has now been resumed. They differ but little from those made of drawn aluminum (now on critical materials list) inasmuch as they retain all their weatherproof characteristics for outdoor mounting.

To the kit, however, has been added a hinge that keeps the lid from being misplaced or lost. This feature is illustrated.

The handy roll-up containing the unit packets drapes easily over the arm, leaving both hands free to administer first aid. A flick of the clip on the bottom of the cylinder releases this roll.

★ ★ ★

More complete information on any of the above items may be had by writing for product literature. Descriptions are condensed from the bulletin "What's New in Safety," which will be mailed to you monthly on request.

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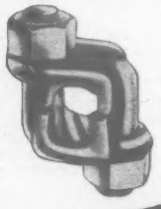
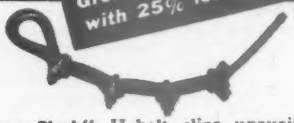
Save time — fewer clips to put on; nuts on opposite sides tighten easier, faster with any type wrench.



Greater holding power with 25% less clips!



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MICHIGAN

Purchase of Evart Gas Field By Chemical Company

SAGINAW, Mich. — Announcement has been made by Dow Chemical Co. of Midland of its purchase of the Evart gas field in Osceola County from Taggart Brothers Co. of Big Rapids, Mich. The 13 wells in the field were developed last year by the Taggart interests and have been capped for several months awaiting a market. Dow plans to extend its present transmission line 5 miles to transport the gas from the field over a 75-mile route to its Midland plant for use as fuel and in chemical extraction procedure.

In Lansing, April 9 and 10, oil and gas lease rights on 34,000 acres of state-owned land in 11 Michigan counties were placed on the auction block by the lands division of the state Conservation Department. Finding a ready sale, some of it at fairly high prices, the offerings attracted nearly 50 representatives of oil and gas interests. Land offered included wildcat acreage in Arenac, Clare, Crawford, Lake, Mason, Midland, Missaukee, Muskegon, Newaygo, Osceola and Wexford counties.

Field activities meanwhile were limited, seven completions being recorded during the past week, resulting in another good producer in the Aetna field of Missaukee County and completion of the first natural-gas well of the year. Gordon Oil Co. completed the Aetna producer for 330 bbl. a day after acid at 3,855 ft. The only other producer was Wolverine Natural Gas Corp. 1 Spitzley in Dallas Township, Clinton County, producing 50 bbl. a day on pump after acid treatment. The four dry holes were wildcat tests.

Ten more drilling permits were issued by the Conservation Department. Bringing the total for the year to 105, they went: two to Allegan County, two to Aetna-Missaukee, two to Mecosta, one each to Clare, Ottawa, Osceola and Van Buren counties.

MICHIGAN COMPLETIONS

Barry County: Assyria Township: Southwest Development Co. 1 Rankin, C N½ NW SE 17-1n-7w, wildcat, dry, T.D. 2,176 ft.

Clinton County, Dallas Township: Wolverine Natural Gas Corp. 1 Spitzley, C S½ SE SW 21-7n-4w, pumping 50 bbl., acidized, T.D. 2,459 ft.

Isabella County, Broomfield Township: Davison Obenauer 1 Fritz, SW SW SW 13-14n-6w, 155,000 cu. ft. gas, T.D. 1,354½ ft.

Midland County, Homer Township: Smith Petroleum Co. 1 Morris, C N½ NE SW 1-14n-1e, wildcat, dry, T.D. 1,372 ft.

Missaukee County, Aetna Township: Gordon Oil Co. et al 2 Reames, SW SW 26-22n-6w, flowing 330 bbl., acidized, with some salt water, T.D. 3,855 ft.

Osceola County, Evart Township: Sun Oil Co. 1 Rice, C N½ NW NE 15-17n-8w, wildcat, dry, T.D. 3,936 ft.

Ottawa County, Jamestown Township: Fisher-McCall Oil & Gas Co. and Harris Oil Co. 1 Brandt-Vankovering, communitized, C SW SE 30-5n-13w, wildcat, dry, T.D. 1,612 ft.

LOUISIANA GULF

Frio Production Opened in Beauregard Parish Wildcat

NEW ORLEANS, La.—Storage tanks have been erected at the General Crude Oil Co. 1 C. S. Baldwin, 27-6s-9w, Beauregard Parish, which has opened production in the Frio. The well was shut in after flowing at an estimated rate of 6½ bbl. of pipe-line oil per hour into pits through ⅛-in. by 6-in. positive chokes. Tubing pressure was 1,150 lb. and casing pressure 1,700 lb. The oil, coming from perforations at 6,512-20 ft., was estimated to be 40.5-gravity. Total depth is 9,412 ft., plugged back to 6,575 ft. A potential test was to be taken within a few days. Active lease and royalty buying is reported. Humble, Magnolia, Shell, and Gulf are among companies which have holdings in the vicinity of the discovery. This is the third oil field opened in Beauregard Parish, and as the productive zone is at moderate depth, development costs should be relatively low.

St. James Parish. — Humble Oil & Refining Co. 1 Panno & Bossetta, ¼ mile from St. James, was waiting for cement to harden after setting 5½-in. casing at 10,895 ft. Tests at 10,763-83 ft. are reported to have shown gas.

Acadia Parish.—Union Sulphur Co. 1 J. P. Gueno, in the Branch area, was drilling at 10,557 ft. in the second sidetracked hole. Side-wall cores taken from 10,432 to 10,456 ft. showed gas. Preparations were being made to set liner from 9,858 ft. to total depth. Continental Oil Co. 1 Acadia Parish School Board, 16-7s-1w, north of the Richie area, was drilling at 7,304 ft. in sandy shale.

Vernon Parish. — Drilling was resumed at M. S. Smith 1 Nona Mills Co., 31-3n-11w, which was abandoned temporarily last August at 360 ft. in gumbo. Operations have been halted for installation of a blowout preventer.

LOUISIANA GULF COAST COMPLETIONS

Wildcat

Jefferson Davis Parish: Continental 1 Flora B. Hopson, 31-10s-42, dry at 11,285 ft.

Fields

Ansa La Butte, St. Martin Parish: George Echols 1 Alex Voorhie, 72-9s-5e, dry at 10,519 ft.

Bayou Sale, St. Mary Parish: Humble 4 Canal Bank & Trust Co., 17-16s-9e, 259 bbl. through ⅛-in. choke, T.P. 1,725 lb., gas-oil ratio 687, perf. 10,350-60 ft., T.D. 11,099 ft.

Quarantine Bay, Plaquemines Parish: Gulf 33 State-QQ, 6-19s-17e, 281 bbl. through 9/64-in. choke, T.P. 1,225 lb., gas-oil ratio 671, perf. 8,322-29 ft., T.D. 8,591 ft.

N. CENTRAL TEXAS

Wildcats and Extension Tests Lead District Activity

WICHITA FALLS, Tex.—Thirty-two new locations were staked in the North Texas district last week, including three wildcats and several extension tests.

Archer County received nine new operations, three of them to go to 5,000 ft. or deeper, two in the Cooper pool and one in the Scotland area.

Archer County.—Tom D. Medders 1 Mrs. O. M. Fuller, southwest extension test to Vogtsberger pool, topped Ellenburger at 5,343 ft., had lime showing oil from 5,347-61 ft., and ran electrical survey to 5,374 ft. It was last reported drilling below 5,385 ft.

Clay County.—Continental 1 Stephens, G. W. Stipps Survey, 2 miles north of Buffalo Springs, had show of oil in sand cored from 5,216-26 ft. and was drilling ahead at 5,235 ft. in shale.

Wise County.—Youngblood & Foree 1 J. S. Berry, Edward Stephens Survey, in the southwestern part of the county, was drilling in Ellenburger at 6,475 ft., but the top was not disclosed. The well has been carried tight all the way. Contract depth of 6,500 ft. will be finished this week.

NORTH TEXAS COMPLETIONS

Wildcats

Archer County: C. T. Hedge 1 J. S. Walsh, Sec. 2417, T.E.&L. Sur., dry, T.D. 1,410 ft.

Mrs. T. A. Norwood et al 1 F. J. Henry, Lot 35, C.&P. Sur., Blk. 5, dry, T.D. 1,200 ft.

L. Sikes 1 Virgil Seay, Blk. 56, J. W. Harris subd., dry, T.D. 1,408 ft.

Clay County: Akin & Dimock 1 W. A. Henderson, S. Hernandez Sur., A-185, dry, T.D. 1,385 ft.

Jack County: Trumter 1 H. R. Bloodworth, William McDonald Sur., A-380, dry, T.D. 430 ft.

Wichita County: Akin & Dimock 1 H. C. Obenhaus, J. Cole Sur., A-37, dry, T.D. 2,015 ft.

Gorman et al 1-A D. G. Parker, Blk. 27, Palo Pinto County School Land, dry, T.D. 1,352 ft.

C. Reid 1 F. A. Davidson, J. R. McDowell Sur., A-194, dry, T.D. 700 ft.

Gorman & Metzner 1 D. G. Parker, Blk. 22, Palo Pinto County School Land, dry, T.D. 800 ft.

Wilbarger County: Consolidated Oil 1-R G. B. Ancell, Jr., 675 ft. from N, 689 ft. from W, SE Sec. 34, Blk. 6, H.&T.C. R.R. Sur., K.M.A. 3,926-60 ft., Caddo 4,110 ft., saturation 4,164-4,205 ft., dry, T.D. 4,528 ft., lime.

Young County: L. A. Long 1 A. A. Donnell, 330 ft. SW and SE of Clear Fork of Brazos, SE part Sec. 1205, T.E.&L. Sur., dry, T.D. 3,665 ft.

Bridwell 1 J. W. Daws, 990 ft. from N and W, Sec. 765, T.E.&L. Sur., dry, T.D. 1,909 ft.

Bridwell 1-A J. W. Daws, 330 ft. from N, 934 ft. from W, Sec. 764, T.E.&L. Sur., dry, T.D. 991 ft.

Fields

Allar, Young County: Panhandle Refining 10 Allar-Hunt, 749 ft. from W, 2,264 ft. from S, Sec. 3409, T.E.&L. Sur., elev. 1,168 ft., flow 590 bbl., 4 per cent water, pay 2,717 ft., T.D. 2,725 ft.

Archer, Archer County: Producers Development 17 G. H. Roach, Sec. 1595, T.E.&L. Sur., I.P. 15 blb., pay 1,261 ft., T.D. 1,273 ft.

Clay, Clay County: J. C. Barnard 3 J. B. Hansard, Lot 2, Thornberry subd., dry, T.D. 1,230 ft.

J. W. Hastings et al 1 Mrs. E. L. Turner, Blk. 55, Specht & McCutcheon subd., dry, T.D. 1,248 ft.

Walton & Turner 2-A G. D. Rigby, Lot 2, Wyatt subd., dry, T.D. 1,182 ft.

East Bryson, Jack County: Phillips 1 W. L. Carney-Pan, 330 ft. from S and E of W 104 ac., C. M. Snodgrass Sur., I.P. 51 bbl., pay 2,907 ft., shot 10 qt., T.D. 2,911 ft.

Electra, Wichita County: Cochran & Cain 1-A W. T. Waggoner, 330 ft. from N and E 80 ac. lease, Sec. 14, H.T.&B. Sur. A-505, I.P. 15 bbl., pay 1,868 ft., shot 10 qt., T.D. 1,872 ft.

Fish Creek, Young County: McLester & Keith 1 W. W. Griffin Est., 330 ft. from N, 660 ft. from W, 166-ac. lease, J. Parham Sur., I.P. 75 bbl. oil, 1,000,000 cu. ft. gas, pay 3,343 ft., lime, T.D. 3,366 ft.

Harrison & Allen, Clay County: Fortex 6 Harrison & Allen, 380 ft. from NW, 330 ft. from SW 160-ac. lease, J. Duncan Sur., I.P. 48 bbl., pay 1,115 ft., T.D. 1,135 ft.

Harrold, Wilbarger County: C. H. Kadane et al 1 R. L. Cochrain, 350 ft. from S, 358 ft. from W, N 46½ ac., Sec. 2, M.K.&T. Sur., A-1891, elev. 1,200 ft., I.P. 206 bbl., pay 3,273 ft., T.D. 3,285 ft.

C. H. Kadane et al 2 R. L. Cochrain, Sec. 47, Blk. 13, H.&T.C. Sur., pumped 29 bbl., pay 3,292 ft., acid 750 gal., T.D. 3,314 ft.

Joy, Clay County: Shell Oil 1 A. Goad, H. Williams Sur., A-704, pumped 140 bbl., pay 3,970 ft., Strawn sand, shot 20 qt., T.D. 4,016 ft.

K.M.A.-Ellenburger, Wichita County: E-C Oil 35-E Anna Mangold, 495 ft. from S, 896 ft. from W, Lot 33, P. Castleman Sur., A-35, pumped 64 bbl., 29 bbl. water, pay 4,395 ft., T.D. 4,434 ft.

Mueller, Montague County: Continental 1 W. A. Richardson, 956 ft. from SE, 455 ft. from SW, 51.16-ac. tract, F. Hamilton Sur., A-335, elev. 1,017 ft., flow 341 bbl., 11 per cent water, pay 6,015 ft., perf. to 6,027 ft., acid 500 gal., T.D. 6,073 ft., new pay.

Muenster, Cooke County: Mudge Oil 14 Alice Johnson, J. Clark Sur., A-794, dry, T.D. 1,698 ft.

Scotland, Archer County: Shell Oil 7-C W. M. Coleman, 929 ft. from E, 330 ft. from S, W½ Lot 4, Blk. 74, A.T.N.C.L. Sur., flow 488 bbl., pay 5,027 ft., lime, T.D. 5,171 ft.

Thornberry, Clay County: Akin & Dimock 1 Joe Stephenson, Lot 55, Specht & McCutcheon subd., I.P. 31 bbl., pay 1,130 ft., T.D. 1,143 ft.,

Jack C. Barnard 4 J. B. L. Hansard, Blk 1, Thornberry subd., dry, T.D. 236 ft

Norwood & Golden 4 P. Roop, Sec. 10, Thornberry subd., dry, T.D. 1,148 ft.

Sussex Oil 1 M. Chapin, Blk. 81, Byers Bros. subd., dry, T.D. 1,173 ft.

Sussex Oil 1 W. V. Groves, Blk. 87, Byers Bros. subd., dry, T.D. 1,401 ft.

Texas Co. 2 Dallas Jt. St. Land Bank, Jane Duncan Sur., A-112, dry, T.D. 1,327 ft.

Walnut Bend, Cooke County: Sun 1 Maggie Bacon, 330 ft. from N and W Blk. 70, Fannin County School Land, elev. 781 ft., flow 684 bbl., ¾-in. choke, pay 5,470 ft., sand, T.D. 5,525 ft.

Wichita, Wichita County: Martin Properties 1-A L. F. Ramming, 1,341 ft. from W, 252 ft. from N, 80-ac. lease, Blk. 1, H. Hastie Sur., I.P. 30 bbl., pay 1,246 ft., T.D. 1,250 ft.

WEST CENTRAL TEXAS

ABILENE, Tex.—J. D. Hancock 1 Black Brothers Ranch, Section 1144, T.E.&L. Survey, southwest of Eliasville in Stephens County, topped Ellenburger at 4,450 ft., had lime with oil stains from 4,495 to 4,502 ft., and was drilling in dry lime below 4,550 ft.

Callahan County.—Hunter & Bunter 1 Tom Windham, Section 145, Block 2, G.H.&H. Survey, Oplin area, had lime showing oil from 2,085-94 ft., Ellenburger topped at 4,046 ft., ran electric log, set 7-in. pipe at 4,045 ft., and was swabbing oil.

WEST CENTRAL TEXAS COMPLETIONS

Wildcats

Jones County: Merry Bros. & Perini and Alder Oil 1 B. E. Hattox, 990 ft. from N and W tract, Sec. 3, J. M. Long Sur., elev. 1,656 ft., dry, T.D. 3,005 ft., shale.

Shackelford County: R. H. Roark 1 M. Chism, SE SW SW Sec. 11, Blind Asylum Land, elev. 1,320 ft., dry, T.D. 703 ft.

Taylor County: Butler & Horne and Ungren & Frazier 1 J. O. Zant, 1,650 ft. from E, 330 ft. from S, 428-ac. tract, David Bruce Sur., elev. 1,698 ft., dry, T.D. 2,265 ft.

Fields

Coker, Coleman County: H. T. Owen et al 3 M. L. Coker, SE SE Sec. 72, Blk. 2, G.H.&H. Sur., flowed 168 bbl., ½-in. choke, pay 3,044 ft., sand, T.D. 3,050 ft.

Dawson & Conway, Shackelford County: Kleiner & Heltzel 2-A Dawson & Conway, 990 ft. from N, 1,320 ft. from E, Sec. 165, E.T.R.R. Sur., elev. 1,753 ft., dry, T.D. 1,661 ft.

Noodle Creek, Jones County: Fain & McGaha 1 West Texas Oil & Royalty Co., 330 ft. from N, 990 ft. from W, Sec. 15, Blk. 19, T.&P.R.R. Sur., dry, T.D. 3,209 ft.

Prichard, Callahan County: Anderson-Prichard 3 Sealy-Smith, 774 ft. from N and W, Sec. 121, Blk. 2, G.H.&H. Sur., elev. 1,951 ft., dry, T.D. 3,056 ft.

Southwest Texas

(Continued from Page 152)

T.P. 2,250 lb., C.P. 2,300 lb., gas-oil ratio 3,285, perf. 7,164-68 ft., T.D. 7,168 ft.

Seeligson, Jim Wells County: Premont Development Co. 1 Premont, Unit 3, B.S &F. Sur. 361, A-70, dry at 7,510 ft.

Ramsey Petroleum Co. 1 J. C. Branhall, R. Ross Sur. 334, A-406, 158 bbl. through 7/64-in. choke, T.P. 1,125 lb., C.P. 1,350 lb., gas-oil ratio 677, perf. 5,913-25 ft., T.D. 5,968 ft.

Stratton, Kleberg County: Humble 30 King Ranch-Cabeza, Paso Ancho de Abajo grant, 131 bbl. through ⅛-in. choke, T.P. 1,000 lb., C.P. 1,200 lb., gas-oil ratio 703, T.D. 6,689 ft.

SOUTH CENTRAL TEXAS COMPLETIONS

Wildcats

Guadalupe County: J. L. Sessions 1 William

Mattke, ½ mi. SE of Elm Creek field, dry at 2,604 ft.

Travis County: Marts & Beavens, Inc., 1 W. S. Red, 2 mi. NW of Elroy, dry at 786 ft.

Williamson County: H. C. Lefors 1 F. H. Schmidt, 3 mi. NE of Taylor, dry at 752 ft.

A. A. Zizinia 1 H. H. Bland estate, 2 mi. SE of Taylor, dry at 675 ft.

Fields

Bee Creek, Caldwell County: Ralph R. Ogden 2 O. T. Moore, J. Gilbert Sur., A-113, dry at 2,306 ft.

EASTERN TEXAS

Paluxy Shows Oil in Wood And Hunt County Tests

DALLAS, Tex.—Prospects for two new Paluxy sand pools were bright as the week opened, one in Wood County and another in Hunt County.

The Wood County test of Bobby Manziel 1 W. F. Bailey, 5 miles southeast of the Coke field, topped Paluxy sand at 6,260 ft. and cored over 12 ft. of oil sand in going to 6,288 ft. according to operators.

Stanolind Oil & Gas Co. 1 Tilson heirs, C. C. Dale Survey, 1½ miles northwest of Campbell, in Hunt County, was bottomed at 4,450 ft. with casing set. Operators perforated with 96 shots from 4,358-84 ft., and brackish water with 10 per cent oil was swabbed. Perforations had been squeezed and the casing was to be reperforated.

Franklin County.—Tide Water and Seaboard 1 Bacon, Block 12, Maximillan Survey, was reaming hole to 7,988 ft. More oil sand had been cored from 7,909-86 ft. First oil sand was cored from 7,840-50 ft.

Henderson County.—Stanolind 1-D Tri-Cities unit, Wiley Kay Survey, bottomed at 7,920 ft., had been unsuccessful in obtaining electric survey of the hole. Several gas shows had been logged from 7,725-80 ft., and it is this zone that will be tested. Same company's 1-B Tri-Cities unit was fishing for logging-device line.

Hunt County.—Humble 1 F. F. Graham, William Elam Survey, 1 mile northwest of Weiland field, set 9⅝-in. casing at 3,925 ft.

Wood County.—Northeast spread for the Quitman field seemed probable as 7-in. casing was set at 6,371 ft. in Roger Lacy et al 1 Stone & Johnson, in the southwest corner of the Anderson Survey. Paluxy was topped at 6,215 ft. and was drilled to 6,383 ft. A new wildcat location 5 miles southeast of Mineola was reported on a block assembled by C. Andrade III, and it was understood that Superior Oil Co. would drill a test to the Paluxy. The Smackover lime test on the east side of the Coke pool, Amerada 1 Turner, had drilled to 7,635 ft.

EAST TEXAS COMPLETIONS

Wildcats

Rains County: American Liberty 1 Republic Insurance Co., 1,980 ft. from N, 660 ft. from E, Henry Howell Sur., 2 mi. E of Emory, elev. 483 ft., Austin chalk 3,530 ft., Eagleford shale 3,830 ft., Woodbine sand 4,672 ft., Georgetown lime 5,122 ft., Paluxy sand 6,218 ft., dry, T.D. 6,337 ft.

San Augustine County: Continental 1 Long Bell Lumber Co., 1,080 ft. W of NE cor., 1,400 ft. S at right angles, Sec. 3, S.P. R.R. Sur., 12½ mi. SW San Augustine, elev. 227 ft., Wilcox 730-60 ft., Navarro 4,588-4,633 ft., Pecan Gap 4,773-88 ft., Buckrange 5,228-38 ft., dry, T.D. 5,514 ft.

Shelby County: Paul Pewitt 1 Pickering Lumber Co., 680 ft. from most northerly NW, 694 ft. from most westerly NE, Milton Cook Sur., elev. 306 ft., Austin chalk 3,125-75 ft., Glen Rose 3,809 ft., Pettit 6,323 ft., Travis Peak 7,103 ft., porosity 6,544-94 ft., dry, T.D. 7,304 ft.

Fields

Hawkins, Wood County: Humble 1-B Farella Scott, 467 ft. from N, 527 ft. from W, 43.52-ac. unit, E. Wideman Sur., dry, T.D. 5,042 ft.

Humble 1-D R. B. Smith, 330 ft. from S and W 40-ac. unit, George Brewer Sur., elev. 340 ft., flowed 319 bbl., pay 4,682 ft., T.D. 4,790 ft.

Kildare, Cass County: C. H. Lyons 2 C. F. Smith, 1,590 ft. from W, 467 ft. from N of 103-ac. tract, B. W. Horton Sur., elev. 242 ft., flowed 125 bbl., 12/64-in. choke, perf. 6,032-35 ft., T.D. 6,065 ft.

Phillips 1 Stotts, 30-ac. tract in SW cor. J. Watson Sur., flowed 156 bbl., 3/16-in. choke, perf. 6,003-05 ft., acid 500 gal., T.D. 6,072 ft.

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The Oil and Gas Journal Tulsa, Oklahoma

OHIO, INDIANA

Second Muskingum Producer Make Big Flow

ZANESVILLE, Ohio.—A 4,370,000 cu. ft. gas well, completed by Ohio Fuel on the H. J. Roll tract in Section 2, Wayne Township, was the second producer found in a newly discovered pool in the Muskingum field. The Clinton pay sand was 3,864 to 3,904 ft. The Brendel Oil & Gas Co. found no production in the wildcat on the Warren tract at Malta. The sand was hit at 4,449-85 ft., and will be drilled through the Medina and plugged. Ohio Oil found water in the Oriskany sand in its wildcat near Cambridge. Ohio is still drilling and will test the Clinton sand.

OHIO COMPLETIONS

Ashland County, Lake Township: Sheridan et al 6 C. E. Ackers, Sec. 16, Clinton, 300,000 cu. ft., T.D. 2,947 ft.

Athens County, Trimble Township: Ohio Fuel 221 Sunday Creek Coal Co., Sec. 11, Berea, dry, T.D. 1,227 ft.

Coshocton County, Pike Township: Pure Oil 2 Joseph McKee, Sec. 18, Clinton, 80 bbl., T.D. 3,274 ft.

Morgan County, Marion Township: Ohio Fuel 4 Hiram Hart, Sec. 34, Salt sand, 1,800,000 cu. ft., T.D. 915 ft.

York Township, Ohio Fuel 1 John Sipos, Sec. 36, Berea, 59,000 cu. ft., T.D. 1,193 ft.

Muskingum County, Perry Township: Ohio Fuel 1 W. F. Brock, third quarter, Clinton, 230,000 cu. ft., T.D. 4,149 ft.

Wayne Township, Ohio Fuel 1 H. J. Roll, Sec. 2, Clinton, 4,370,000 cu. ft., T.D. 3,905 ft.

Washington County, Grandview Township: Edgwood Oil & Gas 11 Jane Hackathorn, Sec. 5, Injun, 35,542 cu. ft., T.D. 1,752 ft.

Lodlow Township—Dixon and Fogle 3 Clarence Rinard, Sec. 31, Berea, 35,901 cu. ft. and 1 bbl., T.D. 1,741 ft.

INDIANA

EVANSVILLE, Ind.—Only two new operations were started in the state in the week in review, Yingling Bros. 1 Dickhaut, NW SE NE 19-6s-12w, derrick; same operators' 2 Dickhaut, a location made in NE SE NE 19-6s-12w, and A. B. Speak 1-A Allyn, NW NW NE 24-6s-13w. Six completed wells included a small gas well, a 20-bbl. oil well and four dry holes.

INDIANA COMPLETIONS

Daviess County: Cannon & Hart 3 Graves, NE NE NE 8-2n-5w, Cannelburg pool, dry 640 ft., Glen Dean sand 518-29 ft., Hardinsburg 535-50 ft., Paint Creek lime 608-18 ft., sand 622-31 ft.

Posey County: Lelalu Oil 2 Dickhaut, NW SW NE 19-6s-12w, dry at 2,747 ft., Benoist sand 2,537-62 ft., Renault 2,580 ft., Aux Vases 2,599 ft., Ste. Genevieve 2,609 ft.; McClosky 2,707-24 ft. and 2,742-45 ft., water.

J. F. Breuil 4 Seifert, SW NE NW 30-6s-12w, 25,000 cu. ft. gas, R.P. 75 lb., sand 290-97 ft.

Vanderburg County, Heusler pool: Superior Oil 4 Nurrenbern, SE NW SW 32-6s-11w, 20 bbl. in 12 hr., shot, Menard lime 1,659 ft., lower Menard 1,729 ft., Waltersburg sand 1,747-55 ft., T.D.

Warrick County: W. Chenault et al 1 Turner, C SW SE 36-9s-9w, dry at 2,132 ft., Glen Dean 1,486-1,504 ft., Golconda 1,601 ft., Barlow 1,714-20 ft., Cypress 1,726-56 ft., water; Paint Creek lime 1,776 ft., Benoist 1,830 ft., Renault 1,896 ft., Aux Vases 1,924 ft., Ste. Genevieve 1,934 ft., McClosky 2,036-44 ft., water.

White County: C. L. McGuire, Inc., 1 Clark, NW NW NW 35-28n-4w, dry at 900 ft., Richland shale at 568 ft.

EASTERN KENTUCKY

ASHLAND, Ky. — Three gas wells were reported completed in eastern Kentucky areas last week and one of these was an outstanding producer.

Drilling operations have pointed slightly upward with several new locations reported and the weather has been of great value to road-building operations.

The Inland Gas Corp. completed 243 J. H. Hammonds et al on the Ricking River in Magoffin County at a total depth of 1,270 ft. in Maxon. The well has a daily open flow of 2,060,000 cu. ft. of gas.

The Kentucky-West Virginia Gas Co. reports the completion of 5438 William Crider, on Clark Branch in Floyd County at 2,520 ft. in shale, with daily open flow of 112,000 cu. ft. of gas.

Unofficial reports list an open flow of 900,000 cu. ft. of gas in a well on the Fitzgerald farm on Rockcastle Creek in Martin County. The well reached a total depth of 2,610 ft.

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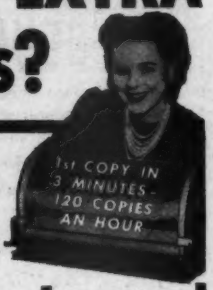

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CANADIAN FIELDS

Drilling to Start Soon In Athabaska District

CHATHAM, Ont.—East Crest Oil Co. is assembling drilling equipment and casing for sipment to its No. 1 drilling location in Athabaska district of northern Alberta. Drilling is expected to start the latter part of April. East Crest Oil Co. and Davies Petroleum have each a 50 per cent interest in some 54,000 acres located about 100 miles north of Edmonton, the acreage including the site of Athadome Oils 2, in which oil shows were encountered some 10 years ago. Heavy oil saturation was found in the upper 26 ft. of a 50-ft. sand but as the objective was the underlying limestone, no definite production test was made. Clean, dry gas was also encountered in a horizon corresponding to the Viking gas sand. Initial wells will cost $12,000 to $15,000 to drill, but later this cost should be reduced to around $7,500.

Bruderheim.—On the Bruderheim structure in northern Alberta, Clonmel Petroleums of Toronto is preparing to drill No. 2 well, spudding this spring. The structure, some 37 miles northeast of Edmonton, was tested last year by Clonmel 1, LSD 4, 32-55-20w4. This well was abandoned at 3,212 ft., but information secured in drilling showed sufficient promise to warrant further tests of the territory.

Kinsella.—In the Kinsella gas field, east of Edmonton, Northwestern Utilities 10, LSD 7, 15-48-11w4, finished at 2,079 ft. with initial open flow of 16,500,000 cu. ft. daily. Northwestern 11, LSD 11, 2-48-11w4, finished at 2,195 ft. with 17,000,000 cu. ft. daily. Northwestern Utilities is planning to do additional drilling this year.

In the portion of the field extending toward Irma, G. Max Bell and associates of Calgary have secured a reservation of around 40,000 acres, mainly in Townships 44-9w4 and 45-10w4, and will drill for oil. Oil showings were encountered some years ago in drilling by Irma Gas Co. and Irma Oil Holdings, in this area.

Vermilion.—Crude-oil production of 1,462 bbl. reported for the Vermilion field in February represented merely the output of five wells of Vermilion Consolidated Oils. In the same period six wells pumped their production into earthen storage and six others were shut in. Changes are now being made to the Vermilion Consolidated conditioning plant at Borrodaile and it is expected to be in operation some time in May. The plant, which treated the output of the field for use as fuel oil, discontinued operations last November owing to insufficient margin between the prices of crude and conditioned oil. The present changes in the plant are designed to reduce operating costs. In addition to crude in sumps, some 6,000 bbl. are stored in a new cement pit at the plant.

An oil-conditioning plant provided by the Alberta government has been installed on the Princeville Petroleum lease for experimental purposes.

Work is being commenced this month on the initial 10-well drilling program of Cannar Oils, subsidiary of the Canadian National Railways. Pacalta Oils is also planning a drilling program in which South End Petroleums will participate, and initial drilling contract has been let.

Herronton. — On the Herronton structure in southern Alberta, east of Okotoks and south of Carseland, contract has been let to Newell & Chandler of Calgary by Shell Exploration Co. to drill Shell-McWilliam 1, LSD 8, 1-21-26w4. Derrick is up and equipment being moved in with spudding scheduled for some time this month.

In the Simpson area, eastern Saskatchewan, Simpson Oil Co. 2, LSD 2, 11-29-25w2, was found to be off structure, and is being abandoned at 2,492 ft. The rig will be moved to NE 22-28-25w2, for No. 3.

In southeastern Saskatchewan, Bobjo Test 6, LSD 13, 36-9-7w2, is preparing to start.

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Turner Valley.—In North Turner Valley, Royalite Oil 68, LSD 10, 22-20-3w5, finished at 7,216 ft. with Madison limestone at 6,616 ft., was acidized with 4,000 gal. and tested 395 bbl. daily of 40.8-gravity crude, initial production, with 1,436,000 cu. ft. of gas.

In the North Central area, Royalite-Lowery 1, LSD 6, 11-20-3w5, finished at 8,170 ft. with Madison at 7,636 ft. was acidized with 14,500 gal., developing initial flow of 75 bbl. of 41.4-gravity crude with 75,000 cu. ft. of gas.

West flank outposts.—On the west flank of the North Turner Valley extension, Northclonmel Royalties 1, LSD 16, 7-21-3w5, finished at 8,850 ft. with Madison limestone at 8,459 ft. It will be a fair producer from the upper zone, running 151 to 186 bbl. in 24-hour test. Arrangements are being made to drill No. 2, probably south of No. 1. Farther south and east, Major Oil 6, LSD 2, 8-21-3w5, also to the west of previous production, and standing in the Kootenay formation at 8,022 ft. has resumed work with Newell & Chandler of Calgary handling the contract for completion.

Bonaventure to test Dalhousie.—Bonaventure Royalties 1, LSD 16, 24-21-4w5, the outpost test in the extreme northwest of the active drilling area, discontinued drilling in the Kootenay formation at 9,643 ft. without reaching the Madison limestone. Cement plug has been set between 9,075-9,225 ft. and production test will be made of the Dalhousie sand, where oil indications were encountered.

East flank test.—On the east flank of the North Turner Valley extension, unusual conditions were encountered in Northwest-Hudson's Bay 13, LSD 9, 8-21-3w5. The test got the Madison limestone at 7,255 ft., drilled through the normal two porous zones and faulted back to the Kootenay formation at 7,808 ft. Drilling will be continued for structural information before testing production.

In the Kamsack shallow gas field, eastern Saskatchewan, Oil Ventures is moving casing and equipment to location for its drilling campaign. Oil Ventures is operating under an agreement with the Kamsack Gas & Oil Co. and will handle all development and field work on acreage of the Kamsack company, the latter handling sales of gas from leases of both companies. Oil Ventures has undertaken to produce a minimum aggregate gas production of 1,500,000 cu. ft. by July 1, and to keep a constant reserve of 1,000,000 cu. ft. in excess of daily consumption.

Alberta production.—Crude-oil and natural-gasoline production from all Alberta fields for the week ended March 29 averaged 26,562 bbl. daily, compared with 27,557 bbl. daily for the previous week and 28,539 bbl.

(Continued on Page 175)

KANSAS, NEBRASKA

Saline County Has Second Pool in Viola Lime

COMPLETIONS in Kansas for the week just past were the highest since early last fall, with 19 oil wells, 1 gas well and 17 dry holes finished. In Saline County, Westgate-Greenland 1 Sudendorf, NW NW SE 30-14-2w, opened the Salina pool with a pumping potential of 124 bbl. Pay zone is the Viola lime at 3,222-32 ft. The well is located just southeast of the town of Salina.

A number of wildcats have been drilled in Saline County over the past year but the few showing oil were flooded with water. The 1 Sudendorf also had trouble with water and when it filled 1,700 ft., only 700 ft. was oil. Total acid treatment was 2,000 gal., after which the well made 15 bbl. of fluid an hour, cutting over 50 per cent water. This is the second pool for the county; the first was the Hunter pool, 20-16-1w, Mississippian chat discovery completed early in February of this year.

Pratt County.—Lion Oil 1 Ford, flowed into pits at the rate of 35 bbl. of oil an hour after cleaning out to 4,145 ft., total depth. It is the discovery of the North Stark pool.

KANSAS COMPLETIONS

Wildcats

Barton County: Champlin 1 Newkirk, NE NE NE 28-20-14w, dry, T.D. 3,583 ft., Lansing 3,302 ft., conglomerate 3,540 ft., Simpson 3,560 ft., Arbuckle 3,570 ft., recovered water on D.S. test at 3,570 ft.

Three Way Drilling 1 Haun, SE SE SE 7-16-14w, dry, T.D. 3,520 ft., Lansing 3,221 ft., conglomerate 3,447 ft., Arbuckle 3,485 ft., porosity and stain dead oil at T.D.

Decatur County: Helmerich & Payne 1 Harger, SE SE NE 29-1-27w, dry, T.D. 3,688 ft., Lansing 3,273 ft., sandy conglomerate 3,615 ft., granite wash 3,648 ft., granite 3,683 ft.

McPherson County: Falcon-Seaboard 1 Krehbiel, NE NE NE 35-19-4w, dry, T.D. 3,686 ft., Lansing 2,570 ft., Mississippian chat 3,248 ft., Viola 3,741 ft., Simpson dolomite 3,763 ft., Arbuckle 3,836 ft.

Phillips County: Northern Ordnance 1 Ruys, SE SE 23-3-20w, dry, T.D. 3,743 ft., Dakota 850 ft., Topeka 3,149 ft., Lansing 3,370 ft., Marmaton 3,597 ft., Arbuckle 3,690 ft.

Russell County: Cities Service 1 Hilgenberg, SE SW NW 16-15-11w, dry, T.D. 3,280 ft., Kansas City 2,879 ft., conglomerate 3,197 ft., Arbuckle 3,249 ft.

Tom Palmer 1 Butcher, SE NE SW 21-12-15w, dry, T.D. 3,347 ft., Lansing 2,964 ft., conglomerate 3,267 ft.

Saline County, discovery of Salina pool: Westgate-Greenland 1 Sudendorf, NW NW SE 30-14-2w, pumped 124 bbl., Viola 3,222-32 ft.

Stafford County: Cities Service 1 Demerell, NE SW 11-25-15w, dry, T.D. 4,085 ft., Topeka 3,132 ft., Kansas City 3,758 ft., bailed 2 bbl. fluid, good show oil, P.B. 3,977 ft., acidized and pumped all water.

Cities Service 1 Grunder, SW NE NE 11-25-15w, pumped 46 bbl., Lansing 3,945-65 ft., T.D. 4,500 ft., discovery of Grunder pool.

Fields

Ahnert, Stafford County: Stanolind 2 Ahnert, N½ NW SE 26-22-13w, dry, T.D. 3,852 ft., Simpson 3,711 ft., Arbuckle 3,760 ft.

Beaver NW, Barton County: Appleman 1 Couchman, NE NW 7-16-12w, dry, T.D. 3,355 ft., Arbuckle 3,347 ft.

Bemis-Shutts, Ellis County: Texas 2-B Bemis, SW SW NW 15-11-17w, salt-water disposal well, T.D. 814 ft.

Carmi, Pratt County: Shell 1 Miskeman, SW NW NE 32-26-12w, 3,000 bbl., flowed 391 bbl. in 7 hr., Arbuckle 4,277-4,320 ft.

Champlin Ref. 1 Steuder, SW SE SW 29-26-12w, 3,000 bbl., swabbed 5 bbl. an hr., Arbuckle 4,292-97 ft.

Chase, Rice County: Aylward Prod. 1 Link, SE SE 18-19-9w, pumped 62 bbl., Lansing 3,121-3,231 ft., T.D. 3,287 ft.

Drach, Stafford County: Atlantic 3 Alpers, SE SE 7-22-12w, 940 bbl., swabbed 18 bbl. an hr., Arbuckle 3,672-78 ft.

Eldorado, Butler County: Molk Pet. 2-A Mills, NE SE NW 27-25-5e, pumped 15 bbl., Viola 2,475-96 ft., T.D. 2,513 ft.

Ellis, Ellis County: Darby 1-A Bittel, W½ SE SW 31-12-20w, pumped 717 bbl., Arbuckle 3,830-45 ft.

Gorham, Russell County: Texas 8 Anschutz, SE NE SW 1-14-15w, salt-water disposal well, T.D. 875 ft.

Greenvale, Russell County: Cities Service 1 Steinle, S½ SW NW 32-14-12w, pumped 213 bbl., Arbuckle 3,175-77 ft.

Greenvale NW, Russell County: Jones & Shelburne 1 Hupfer, NW NW NW 31-14-12w, dry, T.D. 3,175 ft., Arbuckle 3,162 ft.

Henne, McPherson County: H. & M. Drlg. 1 Anderson, S½ NE SE 21-17-1w, dry, T.D. 2,696 ft., Mississippi lime 2,690 ft.

National Pet. 1 Ewert, NW NW NW 18-19-3e, dry, T.D. 2,871 ft., Viola 2,862 ft.

Holcomb, Kearny County: Fin-Ker Oil & Gas 3 Hamlin, C 25-24-35w, 12,700,000 cu. ft. gas, T.D. 2,698 ft.

Keesling, Rice County: Cities Service 1 Abbott, NE SW 16-20-9w, dry, T.D. 3,321 ft., Arbuckle 3,295 ft.

Kraft-Prusa, Barton County: Texas 3-B Burmeister, SW SE 2-17-11w, pumped 527 bbl., Arbuckle 3,373-86 ft.

Lanterman, Barton County: Three Way Drlg. 1 Isern, N½ NE SW 22-19-11w, pumped 50 bbl., Arbuckle 3,348-66 ft.

Lindsborg, McPherson County: Auto-Ordnance 6 Bengstrom, W½ NE NE 25-17-4w, pumped 308 bbl., Viola 3,374-85 ft.

Carter Oil 2 Rundbeck, W½ SW SW 5-17-3w, pumped 171 bbl., Viola 3,349-55 ft.

McLouth, Leavenworth County: Magnolia 3 James Bell, SE SW 6-10-21e, pumped 20 bbl., sand 1,408-18 ft., T.D. 1,433 ft.

Peace Creek, Reno County: Cities Service 2-A Lang, NE SE SW 14-23-10w, dry, T.D. 3,812 ft., Viola 3,795 ft.

Silica, Rice County: W. C. Emrich 1 Binger, NE NW NW 2-20-10w, dry, T.D. 3,318 ft., Arbuckle 3,304 ft.

Phillips 5 Miner, SE SE 35-19-10w, 2,442 bbl., Arbuckle 3,280-84 ft.

Herndon Drlg. 1-A Steckel, N½ NW SE 19-19-10w, dry, T.D. 3,378 ft., Arbuckle 3,348 ft.

Trapp, Russell County: Pryor & Lockhart

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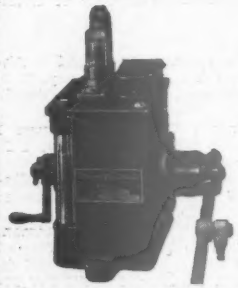

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2-B Boxberger, S½ NE SE 10-15-14w, dual completion, pumped 542 bbl. in Lansing 2,980-89 ft., 260 bbl. in Arbuckle 3,233-35 ft., T.D.

Witt, Russell County: National 2 Boxberger, SW SW SW 3-14-14w, pumped 480 bbl., Lansing 3,001-10 ft.

Zenith, Stafford County: Great Lakes Carbon 2 Buckle, E½ SW NW 3-24-11w, pumped 401 bbl., Viola 3,698-3,714 ft.

Magnolia 4 Darr, NE NW 6-24-10w, 3,000 bbl., flowed 24 bbl. an hr. through choke, Viola 3,696-3,722 ft.

Sinclair-Prairie 1 Buckle, E½ NE NW 3-24-11w, dry, T.D. 3,841 ft., Arbuckle 3,836 ft.

MISSOURI COMPLETIONS

Cass County: Sullivan 1 McPherson, NW SE NE 4-46n-33w, dry, T.D. 560 ft.

APPALACHIAN FIELDS

More Oil Found in West Virginia Oriskany Sand

PITTSBURGH, Pa. — Additional oil from the Oriskany sand in the gas field in Jackson County, West Virginia, proved of interest during the week but no great hopes are being entertained that it will prove more than a local condition. This was the only report of additional oil in either that state or Pennsylvania.

SOUTHWEST PENNSYLVANIA COMPLETIONS

Greene County, Franklin Township: Waynesburg Home Gas Co. 1 Abner Tharp, drilled deeper, 33,000 cu. ft. gas, Fifth sand 2,960-98 ft., gas 2,963 ft., Bayard 3,084-91 ft., gas 3,087 ft., T.D. 3,240 ft.

Jackson Township: Manufacturers Light & Heat Co. 6 Mary E. Smith, 273,000 cu. ft. gas, Bayard sand 3,411-14 ft., gas 3,411-14 ft., T.D. 3,470 ft.

Washington County, Hanover Township: D. D. Caldwell et al 2 Evaline Caldwell, dry, T.D. 1,023 ft.

Robinson Township: Arthur Chivers et al 1 Irene Glass (Osborne), very light gas well, Fifth sand 2,277-90 ft., R.P. 24 lb., 20 hr., T.D. 2,298 ft.

WEST VIRGINIA

The United Fuel Gas Co. and the Spartan Gas Co.'s well on the D. J. Rogers farm, Jackson County, is drilling at 5,071 ft. with a gas volume of 1,614,000 cu. ft. and also making about 40 bbl. of oil. This is the heaviest recent Oriskany oil show. Gas pay was logged at 5,056-64 ft. and oil pay at 5,064-68 ft. In this district the United Fuel Gas Co. 5134 W. W. Shinn was bottomed at 5,348 ft. after deepening and it is producing about 10 bbl. a day along with 862,000 cu. ft. of gas. Here the surface elevation is 983 ft., with the Corniferous lime 5,206 ft.; Oriskany 5,304 ft., gas 5,306-10 ft., oil pay 5,305-10 ft.

Tucker County. — In the Dry Fork district, Ohio Oil Co.'s test on the Kaemmerling tract is drilling in lime shells at 3,157 ft.

Putnam County.—In the Pocatalico district, Godfrey L. Cabot, Inc. 1087 Hatfield-Campbells Creek Coal Co., reported as a gas well in the Big lime gaging 1,547,000 cu. ft. of gas, was acidized and the final open flow was

3,800,000 cu. ft. Well No. 1060, same lease, increased production after acidizing from 735,000 cu. ft. of gas to 969,000 cu. ft.

WEST VIRGINIA COMPLETIONS

Boone County, Scott district: Owens, Libby-Owens Gas Dept. 693 Allen & Pryor, 1,107,000 cu. ft. gas, Big lime 1,494 ft., T.D. 1,661 ft.

Kanawha County, Elk district: Hafer & Jones 1 J. M. Hill, dry, T.D. 2,755 ft.

Lincoln County, Jefferson district: United Fuel Gas Co. H296 Huntington Gas Development Co. 465,000 cu. ft. gas from brown shale, Big lime 1,708 ft., Injun 1,909, Berea 2,406, brown shale 3,455, T.D. 3,672 ft.

Logan County, Logan district: Boone County Coal Corp. 31 fee, 190,000 cu. ft. gas, Big lime 2,064 ft., Injun 2,245, Berea 2,748, T.D. 2,799 ft.

Marion County, Paw Paw district: Owens, Libby-Owens Gas Dept. 1 Presley Morris, 125,400 cu. ft. gas, Gordon sand, T.D. 3,254 ft.

Ritchie County, Grant district: F. S. Deem 28 L. C. Stephens, 900,000 cu. ft. gas, Maxton sand 1,700 ft., Big lime 1,775, Injun 1,850, gas in Squaw sand, T.D. 1,958 ft.

ORISKANY GAS FIELDS

Jackson County, Ripley district: United Carbon Co. 1096 J. O. Harpold, 5,179,000 cu. ft. gas, elev. 715 ft., Oriskany 4,980, shot 4,986-5,013 ft., R.P. 1,440 lb., 24 hr., T.D. 5,017 ft.

Columbian Carbon Co. 691 Parsons-Burch, 3,341,000 cu. ft. gas, Big lime 2,110 ft., Oriskany 5,106 ft., shot 5,107-57 ft., T.D. 5,167 ft.

Washington district: United Fuel Gas Co. 5145 Bertha Matthews, 7,955,000 cu. ft. gas, Oriskany 5,149, gas pay 5,150-65, T.D. 5,165 ft.

NORTH LOUISIANA, ARKANSAS

Wildcat Opens Pool West Of New London Area

SHREVEPORT, La.—In the southeast extension to the Sugar Creek field, Hassie Hunt's 1 W. J. Byrd, SE NW 17-19n-5w, 3 miles southeast of the main body of the field, was completed last week for a flowing potential of 1,152 bbl. in the Travis Peak zone at 5,579-88 ft. Total depth was 6,265 ft. Permits were obtained for the 2 and 3 Byrd, which will be west and north offsets.

In Union County, Arkansas, Arkhill Oil Co. 1 Union Saw Mill, a wildcat in SW SW 17-18s-12w, about 3 miles west of the New London field, was flowing by heads while testing after perforations were made at 2,527-41 ft. Total depth was 3,024 ft.

ARKANSAS COMPLETIONS

Rainbow City, Union County: Sam Richardson 1 Moody, SW NW 16-17s-14w, 200 bbl., pay 3,242-47 ft., T.D. 3,518 ft.

Stephens, Columbia County: T. W. Lee 1 Grayson, NE SE 10-15s-20w, dry, T.D. 2,600 ft.

R. H. Crow 1 Guttry, SW SW NE 11-15s-20w, 240 bbl., Tokio sand 2,462-72 ft., T.D. 2,550 ft.

R. H. Crow 1-C Taylor, SW NE NE 12-15s-20w, 147 bbl., sand 2,894-2,910 ft., T.D. 4,182 ft.

G. H. Vaughn 1 W. G. Taylor, SE NW 12-15s-20w, 40 bbl., Travis Peak 3,396-3,408 ft., T.D. 3,999 ft.

NORTH LOUISIANA COMPLETIONS

Wildcats

Catahoula Parish: Grubb & Hawkins 1 Peck, 41-10n-8e, dry, T.D. 5,935 ft.

Claiborne Parish: Gulf Refining Co. 1 Miller, NE NE 14-20-8w, dry, T.D. 10,761 ft.

Fields

Catahoula Lake, La Salle Parish: Placid Oil 1 W. S. Taylor, C N½ Lot 12, 40-7n-3e, dry, T.D. 4,208 ft.

Hosston, Caddo Parish: Bayou State Oil Corp. 2 Chiles, NW NW NW 31-22n-15w, 500,000 cu. ft. gas, Nacatoch 1,058-76 ft., T.D.

Pine Island, Caddo Parish: Bagley & Lewis 1 Vaughn, SW SE NW 7-21n-14w, 65 bbl., pay 1,520-1,675 ft., T.D.

Sugar Creek, Claiborne Parish: Hassie Hunt 1 W. J. Byrd, SE NW 17-19n-5w, 1,152 bbl., Travis Peak 5,579-88 ft., T.D. 6,265 ft.

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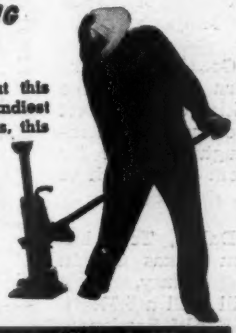

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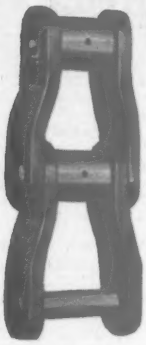

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Among the Drilling Contractors

Addison Drilling Co., Midland, Tex., moved in to drill Repollo Oil Co. 1 Johnson, on the east edge of the Square Lake pool in Eddy County, New Mexico. The pool produces from about 3,200 ft.

Edgar Johnston, Longview, Tex., has contracted to drill a wildcat test in Wood County, Texas, west of the Coke pool. The well is Murray Sells 1 Morgan, in the Harvey Hall Survey.

Delta Drilling Co., Tyler, Tex., has taken another wildcat contract in Franklin County, East Texas. The well is L. A. Grelling, Jr., 1 J. P. Stanley, in the William Jordan Survey, Lake Franklin area.

C. T. McLaughlin, Big Spring, Tex., has taken a farmout from Shell Oil Co., Inc., in Lea County, New Mexico, and will drill a wildcat in NW NE 7-17s-33e, which is 3 miles northeast of production in the Maljamar pool.

Trinity Drilling Co., Dallas, Tex., extended the eastern limits of the Slaughter pool, Hockley County, West Texas, one location eastward by completing 1 Alex Slaughter estate for 480 bbl. per day from total depth of 5,035 ft.

M. J. Delaney, Dallas, Tex., has taken farmout from Texas Co. in southwest Martin County, West Texas, where he will drill a 5,500-ft. cable-tool test in SE SW Section 7, Block 39, Township 1n, T.&P.R.R. Survey.

B. A. Duffy, Abilene, Tex., this week completed a dry hole for A. G. Talbot in Menard County, Texas. The test went to 3,466 ft., and had some oil shows in the Ellenburger lime.

Loffland Brothers, Fort Worth, Tex., and Tulsa, are below 6,800 ft. on a deep wildcat for Humble Oil & Refining Co. on the Sawyer Cattle Co. ranch in eastern Reagan County, Texas.

Parker Drilling Co., Tulsa, had work under way this week at two Washita County, Oklahoma, wildcats for the Gulf Oil Corp. Both wells are to be deep tests, with no certain contract depth. The 1 Hopkins, NW SE 8-9n-20w, about 5 miles northwest of Port, was drilling below 800 ft. after setting surface pipe and the 1 Perkins, SE SW 31-8n-17w, 4 miles north of Hobart, had cellar and pits dug.

Baldridge & King, McAllen, Tex., have spudded 1 Albino Hinjosa, a wildcat test which they will drill for their own account 2 miles southwest of San Roman, Starr County, Texas. Another Starr County wildcat which they are putting down for themselves

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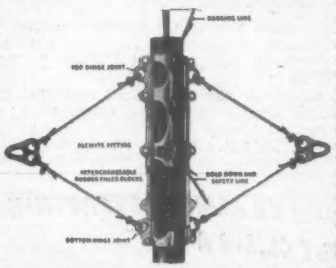

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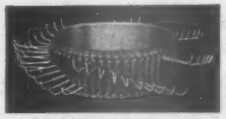

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is 1 Mary Edgerton, a Texas Co. farm-out in Jose Antonio de la Garza Falcon, Porcion 80.

Sultana Drilling Co. received contract from the Mansfield Hardwood Lumber Co. of Shreveport, La., to drill the 1 fee in 8-12n-4w. Location is about 2½ miles northeast of the Calvin distillate pool in Winn Parish, Louisiana.

Osborne Drilling Co. had set surface pipe the first of the week at Superior Oil Co. 1 Mansur, NW SW SE 26-18n-6e, west of Drumright in Payne County, Oklahoma. Contract depth is 3,600 ft. or the Wilcox sand.

Jack W. Frazier, Houston, Tex., was moving in material for 3 McCrory, in the M. L. York Survey, Jackson County, Texas. Walter Van Norman, D. M. Wallace, and Mr. Frazier are joint operators in this well, which will be carried to about 5,400 ft. No. 2 McCrory, owned by the same interests, was completed recently at 5,446 ft. in the same area.

Gilger Drilling Co., Inc., Houston, Tex., last week spudded 1 Davis, a prospective northern extension of the new Kildare field in Cass County, Texas, for Grubb & Hawkins and Gilger. Operators expect to carry the hole to 6,050 ft. This contractor has just finished 5 Cass County fee for the same operators. Gilger has started work also on a well for Royal Fisher, the 1 Caesar-Rhone, near Jonesville, Catahoula Parish, Louisiana.

W. W. Zimmerman, McAllen, Tex., who drilled the discovery well of the Ulrich field in Starr County, Texas, last year, is the contractor on Ike Howeth 1 E. P. Caffarelli, which is showing for another pool opener 10 miles north of Rio Grande City, in Starr County. The well, originally scheduled to go to 4,250 ft., is bottomed at 3,626 ft.

Hollow Drilling Co. has expanded its executive personnel, the expansion being authorized by the board of directors at a meeting held in Wichita, Kans., last week. Lester L. Morris, secretary of Foulston, Siefkin, Bartlett & Morris, will join the organization as a full-time executive on May 1. Frank Leach, of Wichita Falls, Tex., formerly with Shell Oil Co., Inc., will also join the organization May 1 as production manager, with offices in Inman, Kans. All officers of the firm were reelected. These include: President, F. H. Hollaw; vice presidents, Howard S. Bryant and W. B. Hollaw, and treasurer, C. M. Toevs.

H. C. Williams has been awarded contract to drill Charles J. Smith 1 Rose Howard, NE NE NE 24-4n-13w, Allegan County, Michigan.

Turner Drilling Co. is the contractor on Turner Petroleum Corp. 1 Carson S. Harvey, C S½ SW SE 11-17n-3w, Clare County, Michigan. Turner Drilling also has contract on Cities Service Oil Co. 1 Cornelius De Young, C S½ SW NW 26-22n-6w, Missaukee County, Michigan.

Ashby Drilling Co. has been awarded contract to drill Gulf Refining Co. 3 A. Bunning, C NW NE 35-22n-6w, Missaukee County, Michigan.

Lima Drilling Co. will drill Robert L. Sanders 1 John and Sena Janssen, C SW SW 36-5n-15w, Ottawa County, Michigan.

Brewster-Bartle Drilling Co. has staked location for an 8,500-ft. wildcat test, 1 mile north of the Bay City pool, Matagorda County, Texas. It is the 1 Fuller-Nelson, 467 ft. east at right angles from the G.C.&S.F. Survey and 467 ft. southwest at right angles from the northeast line of a 200-acre tract in Block 5, T.&N.O. Surveys 1 and 2.

Olson Drilling Co., Tulsa, was setting pipe at 1,200 ft. at the Woodward County, Oklahoma, wildcat of Northern Ordnance, Inc. The well, 1 Bradshaw, SE SE 28-22n-17w, about 3 miles northwest of the town of Cedardale, is contracted to 9,750 ft.

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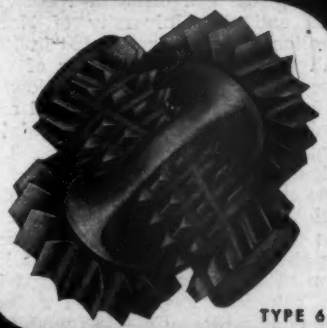

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PERSONALS

OTIS O. COLE

South Penn's Chief Engineer Gets New Duties on Board

OTIS O. COLE, Pittsburgh, Pa., who recently became a director of the South Penn Oil Co., has a 32-year service with the company, which is one of the leading operators in the Pennsylvania Grade district. He succeeds P. H. Curry on the board of South Penn. Mr. Curry recently resigned as president of the company and a director.

Mr. Cole joined South Penn Oil Co. in 1911 and was assigned to engineering and geological work at Oil City where he married Eugenie Rehr. He was born at Morgantown, W. Va. He attended the University of West Virginia and the University of North Carolina where he graduated in 1908 with the degree of bachelor of science in civil engineering. Following his graduation he was employed as a mining engineer by the Consolidated Coal Co. and the Jamison Coal Co., Fairmont, W. Va.

After spending 6 years at Oil City with South Penn, the new director was transferred to Pittsburgh and has since been located there. He has been chief engineer and geologist for the company for the past several years and will continue to function in those capacities in addition to assuming duties of a director.

Robert I. Ballard, formerly draftsman for Union Oil Co. of California in Houston, Tex., now one of the naval Seabees on Guadalcanal, writes that "heat, rain and insects" keep life from becoming dull. All natives are "Joe." Other Houston men in the outfit are **P. J. Ewald,** production inventory man for General Crude Oil Co.; **E. W. Petty,** switcher in the Overton, Tex., field, and **J. D. Dickson,** production-department clerk, J. S. Abercrombie Co.; **Cody Isbell,** truck driver, Houston Lighting & Power Co.; **T. O. Main,** cracking-department pumper, **A. L. Tilley,** stillman's helper, and **B. J. Walters,** powerhouse helper, Shell Oil Co., Inc.

Douglas Glover, of Houston, Tex., technical sergeant in the Army Air Corps and on overseas duty, received the Air Medal in London last week at ceremonies in which several American fliers were decorated. Until he entered military service in December 1941 Sergeant Glover was working for Gulf Oil Corp. as a field man in the telephone and telegraph department and at the same preparing for entrance to Texas A. & M. College. A few days after he was awarded the Air Medal the plane in which he was returning from a raid on a German position caught fire and he bailed out on English soil.

G. C. Blair, in the laboratory of Humble Oil & Refining Co.'s Baytown, Tex., plant, has been chosen president of the board of governors of the Baytown Country Club for the ensuing year. **Ralph Sharpless,** Humble engineer, is the new vice president, and **Doyle E. Thomas,** tabulating supervisor in the accounting department, secretary and treasurer. Other Humble men who have been made members of the club's board are **Thomas W. Moore,** head of the industrial-relations department; **Harry F. Hartman,** engineer; **E. O. Camp, M. W. Morgan,** and **J. J. Keenan,** laboratory; **George Bays,** in the laboratory of Humble's Baytown Ordnance Works; **J. W. Frymire,** dock foreman; **George H. Crawford,** assistant chief clerk, accounting department; **Harry Karkowski,** accounting department; **L. M. Trenckmann,** bulk-station manager.

Durght Tarpenning, of the Continental Oil Co. land department, has been transferred to Casper, Wyo., from Great Bend, Kans. Prior to that he was in the company's offices at Ponca City, Okla.

John A. Diodeno, formerly engineer in the New Orleans, La., division office of Humble Oil & Refining Co., has been advanced to district petroleum engineer in the Darrow district, Ascension Parish, Louisiana, where he will have charge of all petroleum-engineering work. Mr. Diodene graduated in mechanical engineering from Tulane University.

Clayton L. Nairne, general superintendent of the gas department, has been made assistant to the vice president in charge of operations for New Orleans Public Service, Inc. Succeed-

C. L. NAIRNE

J. H. COLLINS

ing Mr. Nairne as general superintendent of the gas department is **Jeffrey H. Collins,** who has been superintendent of the distribution division of the gas department for the past 3 years. Mr. Collins, who will soon have an anniversary of 20 years' continuous service with the company, has served as chemist and assistant superintendent of gas production, as assistant and superintendent of the meter and appliances division before becoming superintendent of the distribution division.

George Cecil, formerly in the Medicine Lodge, Kans., producing division of Lario Oil & Gas Co., producing subsidiary of Globe Oil & Refining Co., has been transferred to Ridgway, Ill., where he has been placed in charge of production operations in the West Inman field, Gallatin County, Illinois.

J. N. McGirl has been appointed to the position of district manager at Tulsa of the land and exploration department of Tide Water Associated Oil Co., succeeding **R. V. L. Stratton,** who has recently retired. Mr. McGirl graduated from Missouri School of Mines in 1922 and since that time has had extensive experience as a geologist, engineer and operator in Venezuela and in the Mid-Continent states. From 1926 to 1932 he directed the activities at Tulsa for W. C. McBride, Inc., and Silurian Oil Co.

Mel W. Fuller of Mattoon, Ill., eastern division geologist for Carter Oil Co., is being advanced to chief geologist of the company, effective April 15. He relieves **Harold F. Moses** whose duties as manager of Carter's exploration department and a director require that he relinquish the chief geologist assignment.

W. E. WRATHER

William E. Wrather, petroleum geologist of Dallas, Tex., who for the past few months has been serving as associate chief of the Metals and Minerals Division of the U. S. Geological Survey, has been named director of the survey. He succeeds **Walter C. Mendenhall,** who retired a couple of months ago after 48 years of service with the survey, 12 of which he served as director. Mr. Wrather is a graduate of University of Chicago, and has served as geology professor at Chicago, Northwestern, Yale and Texas universities. He has been a consulting geologist in Dallas for the past 25 years.

R. W. Beck has been appointed assistant southern division geologist by Carter Oil Co., under **P. C. Cochran,** Shreveport, La. **D. L. Blackstone** has been made assistant northern division geologist for Carter under **O. A. Seager** at Billings, Mont.

Charles P. Collins, Bradford, Pa., oil man, has been commissioned a second lieutenant in the U. S. Signal Corps. He is a son of the late Burt H. Collins, oil producer, and grandson of two pioneer oil men, Charles P. Collins and Charles P. Byron.

J. O. Green has resigned his position as plant superintendent for Barnsdall Oil Co. at Earlsboro, Okla. In 1918 he supervised the construction of the White Oak gasoline plant at Beggs, which was later purchased by the Waite Phillips Co. When Barnsdall Oil Co. purchased the Phillips company, he was made superintendent of construction in the gasoline department. He supervised the construction of Barnsdall's Earlsboro gasoline plant, and continued there as plant superintendent since 1927.

O. B. Perot, oil producer of Waco, Tex., has purchased a ranch of more than 2,000 acres, 21 miles west of Waco.

J. K. Hufendick, formerly superintendent of producing operations for Texas Co. in southern Oklahoma, has been transferred from Oklahoma City, Okla., to Tulsa, where he assumes supervision over the company's producing operations throughout the state. After a tour of service that included duties as rig helper, field engineer, district engineer and assistant superintendent, Mr. Hufendick spent 3 years with Texas Co. in its Barco concession in Colombia, where he supervised the development of the Petrolea field and the discovery of three additional pools. He returned to the United States in 1941.

Lt. Rush Greenslade, Jr., son of the executive vice president of Gulf Oil Corp., Tulsa, has been credited with his first aerial victory in the South Pacific. A navigator on a bomber he took the place of a gunner and knocked down a Japanese plane.

Beverly G. Brown, superintendent of maintenance and construction of Tide Water Associated Oil Co., Associated division, has been promoted to a captaincy in the U. S. Army Corps of Engineers.

Vincent W. Finch, engineer in the exploitation department of Shell Oil Co., Inc., has been promoted to geologist and transferred to the company's Bakersfield, Calif., office.

F. H. Bosworth, buyer for Standard Oil Co. of Indiana, and a service record of more than 50 years, retired on company annuity April 14. In honor of his golden anniversary of service last December 18 he was awarded a gold watch by the board of directors. Filling ink wells and running errands for $3.50 a week when he was 14 years old was Mr. Bosworth's first job with Standard. He advanced through the ranks and assumed his position as a buyer in 1923.

James J. Morrison, superintendent of the Canadian Western Natural Gas, Light, Heat & Power Co. at Lethbridge, Alta., was guest of honor at a banquet tendered by the staff marking his completion of 30 years in the company's service.

Thomas F. Phillians, of Shell Oil Co., Inc., who began work with Shell as a draftsman and was later advanced to senior draftsman, has been promoted engineer and transferred to the company's pipe-line department in Los Angeles.

Tom C. Mooney, New York, chief engineer for Standard Oil Co. of New Jersey and for Lykes Bros. Steamship Co., is a prisoner of the Germans, according to a postcard from him received by James A. McIntosh, vice president of Todd-Galveston Dry Docks, Inc., Galveston, Tex. The card indicated he was being held in the vicinity of Hamburg. Mr. Mooney said his ship was sunk in the Arctic Ocean and that he was rescued by an airplane.

Francis Whalen, formerly maintenance and construction engineer at the Baytown, Tex., refinery of Humble Oil & Refining Co., is now a first lieutenant, assigned to duty as an engineering officer at Bolling Field, District of Columbia. Lieutenant Whalen graduated in 1939 as a mechanical engineer at Rice Institute, Houston, Tex., his home, and immediately entered employment with Humble. He resigned for military service in January 1942, and 5 months later was commissioned a second lieutenant.

Shifts: **G. W. Blackburn,** superintendent, Woodley Petroleum Co., Kilgore to Odessa, Tex.; **Perry R. Love,** engineer, Magnolia Petroleum Co., Troup to Grand Saline, Tex.; **Robert Ferris,** engineer, Shell Oil Co., Inc., Centralia, Ill., to Tulsa; **M. R. Hayes,** engineer, Phillips Petroleum Co., Bartlesville, Okla., to Odessa, Tex.; **H. M. McDonald,** superintendent, War Emergency Pipelines, Inc., Longview, Tex., to Little Rock, Ark.; **George Martin,** superintendent, Barnsdall Oil Co., Stamps, Ark., to Victoria, Tex.; **Wayne C. Rauch,** geologist, Lion Oil & Refining Co., El Dorado, Ark., to Tyler, Tex.

Guy S. Conners, vice president and general superintendent, Williams Brothers Corp., is recovering from an operation performed recently to correct trouble resulting from an appendectomy performed a number of years ago. It is expected that he will continue to be at the Good Samaritan Hospital, Cincinnati, Ohio, for several weeks.

William Leo Havard, Houston, Tex., recently advanced from second lieutenant to first lieutenant in the Army Air Corps, has been made post communications officer at Moore Field, Texas. He had been assistant post communications officer at Randolph Field, Texas. Before entering military service last August Lieutenant Havard was employed in the laboratory of Schlumberger Well Surveying Corp., Houston.

Market Developments

East Coast

NEW YORK. — A substantial improvement in the East Coast oil-supply situation, as measured by the daily balance between income and outgo of products, has occurred during the past few days, largely as a result of an increase in the tank-car movement. This gain in rail receipts is attributed to the first shipments by tank car from Norris City, Ill., and marks what is expected to be a permanent betterment in the East Coast supply situation.

Despite this improvement in the current outlook, the trade is cautioning against undue optimism in view of the present low level of inventories in the East Coast. The possibility remains that withdrawals will be large for export from East Coast over the next few months. As the quantity of these withdrawals cannot be estimated at this time, the East Coast supply situation for the future is not capable of accurate analysis.

Considerable improvement in heavy fuel-oil output has followed the increase in prices, but small distributors in this territory continue to complain of small margins. They did not benefit by the recent increase in prices.

Mid-Continent

REFINERY markets continued unchanged this week. Firmness of the market, if support other than consumption were needed, could be entirely justified by the strength of crude oil and the difficulties faced by refiners in maintaining supplies of raw material at levels essential to operations.

Buyers are absorbing practically all offerings of gasoline without quibbling over current quotations. Much of the business is moving to agricultural centers where consumption has suffered comparatively little decline from rationing regulations. The planting season is still ahead for parts of the midwestern agricultural district.

Calls for kerosene and distillate fuels are less acute than during the first 3 months of the year but residual oils are in even greater demand now than in previous months of the war. Most war industries are now on full production, meaning that fuel oil required in the manufacture of armaments probably is now at the crest of the emergency period.

Refiners report that Directive 65, calling for withdrawal of supplies from the nearest terminal, has caused no particular change in operations. Most of the exchanges, aimed at the elimination of crosshauls and other nonessential transportation, were worked out by the industry earlier in the year when operators were authorized to make these moves. Natural gasoline is holding constant, despite limited offerings at concession prices in certain isolated manufacturing areas. Transportation is the chief deterrent to normal markets for natural gasoline.

There is a fairly close balance between 26-lb. products and the apparent summer demand, possibly indicating that low prices which usually prevail during the warmer months will be modified this year. Demand for war products this year will take up the slack customarily developing during the summer in the consumption of liquefied petroleum gases, thus maintaining stabilization operations somewhere near their winter peak.

Gulf Coast

HOUSTON, Tex. — Improvement in the general tone of the refinery market was reported this week. Although some of the smaller refiners unequipped to make the higher grades of gasoline continued to have difficulties, most operators, covering the whole range from little to big, were said to have adjusted themselves to wartime conditions. Curtailed transportation facilities continue to be a severe handicap, but there too the situation is somewhat better. From 40,000 to 50,000 bbl. of gasoline are said to be running daily now through the Bayou-Plantation Pipe Line system, affording an outlet to the East Coast for Gulf Coast refiners to whom that line is available and appreciably easing the pressure on overtaxed shipping facilities.

All products with the exception of gasoline in the low-octane brackets were said to be moving with sufficient freedom to place inventories in a better position than they had been for weeks. Ceiling prices were reported to be obtainable in most cases, excepting again the lower grades of motor fuel, which must be disposed of locally and almost exclusively by truck. Reconditioned barges, some privately owned and some rented, moving to both the eastern and western coasts, are helping to make a difficult situation less serious.

Kerosene was reported to be exceedingly tight. Scarcity of this product is so severe that marketers hesitate to accept orders.

Pacific Coast

LOS ANGELES, Calif.—Recent price increases in California heavy crude oil will undoubtedly stimulate drilling and present indications point to the probability that it will be needed because fuel-oil demand in Pacific Coast territory averaged 425,000 bbl. per day during February and continued during March and so far this month.

Demand for all products reached 827,000 bbl. daily during February, the highest in a number of years.

There was very little activity in the refined-oil market this week. Prices remain unchanged. Very little progress was made in attempts to eliminate cut-rate prices, owing to large stocks held at service stations. One independent refiner came out this week with an 87-octane Ethyl gasoline to sell at the same price as other gasolines. Ethyl sales of this marketer are claimed to be 800 per cent ahead of volume 2 years ago while competitive-grade gasoline, formerly a big seller, has dropped precipitiously. This appears to be a general characteristic of the market and explains the low demand of the trade for third-structure gasoline and consequent low price.

Gas oil continues in good demand but there were no major sales during the week.

A.P.I. REFINERY REPORT

Week Ended April 3, 1943

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	157	2,547	459	848
Ind., Ill., Ky.	657	20,483	2,328	3,063
Okla., Kan. Mo.	313	7,408	1,352	1,614
Censored area*	1,709	40,343	10,170	14,033
Rockies	81	2,036	528	346
California	707	20,592	52,846	10,828
Total 4- 3-43	3,624	93,409	67,483	30,732
Total 3-27-43	3,742	94,07[illegible]	67,936	30,980
Total 4- 4-42	3,499	106,406	81,953	30,095

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
April 3, 1943	239,864,000
March 27, 1943	239,126,000
April 4, 1942	281,768,000

*Excludes unrefinable California stocks.

Refinery Prices

(Prices as of April 13)

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	†80	74-76	72-74	68-70	63-66
Mid-Continent*	.....	.....	5.875-6.000	.....	5.500-5.625
Pennsylvania	.....	6.750-7.000	.....	.....	.....
Gulf Coast‡	6.00-6.50	.....	§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.80	.....	9.2	9.2	.....
California	.....	6.125-6.500	6.000-6.125	5.500-6.000	5.000-5.250

*Basis Group 3. †1939 C.F.R. (research method). ‡Integrated companies restricted to lowest prices. §Unleaded.

KEROSENE AND NO. 1 FUEL OIL

Gravity:	46	45	42-44	41-43	38-40
Mid-Continent*	.....	.....	4.500	4.375	.....
North Louisiana	.....	.....	.....	4.500-4.750	.....
Pennsylvania	6.250-6.625	6.125-6.250	.....	.....	.....
California	.....	.....	.....	4.500-5.500	4.250
Northeast Coast	.....	.....	.....	6.80	.....
Gulf Coast	.....	.....	.....	4.125	.....

*Basis Oklahoma Group 3.

TRACTOR, DIESEL, AND BUNKER FUEL OIL

Specifications:	46-48° G.	24 D.I.	48-52 D.I.	58 & above	Diesel bunkers	Residual Bunker C§
Mid-Continent*	4.125	.....	.....	.....	.....	$0.80-1.27
California	.....	2.750-4.000	.....	.....	‡1.45-1.50	0.95-1.00
Gulf Coast	.....	.....	4.000	4.125	1.45	0.85-1.27
Northeast Coast	.....	.....	.....	6.800	2.780	1.65-2.07
North Louisiana	.....	.....	.....	.....	.....	0.80-1.27

*Basis Oklahoma Group 3. †10-14° gravity. ‡Pacific Specification 200. §Gravity range.

FURNACE OIL, GAS OIL, FUEL OIL

	No. 2	No. 3	No. 5	No. 6
Mid-Continent*	3.625-3.750	3.500-3.625	$0.85	$0.80
Pennsylvania (West)	5.875-6.125	5.875-6.000	†5.250-5.500	.....
Northeast Coast	6.7	6.7	1.95	1.65
California	5.5	5.5	‡1.10-1.25	§1.10-1.15
Gulf Coast	3.875-4.0	.....	1.65	0.85

*Basis Oklahoma Group 3. †36-40 gravity fuel. ‡Pacific Specification 300. §Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	3.875	4.650
North Texas	3.500	4.200
North Louisiana	3.625	4.350
California	4.875	5.500

LUBRICATING OILS

Bright and Steam Refined

OKLAHOMA (Group 3)—		
200-210 D, 10-25		27.00
150-160 D, 0-10		23.00
120-125 D, 0-10		22.00
Stea refined:		
600 dark green (untreated)	9.00	9.50
PENNSYLVANIA—		
Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash)		
10 pour point		30.50
15 pour point		29.50
25 pour point	25.00	28.00
Steam refined:		
600	15.00	16.00
650	15.50	16.50
600 flash	16.00	17.50
630 flash	17.00	17.50

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—	
0-10 pour point:	
200-3	15.00
300-3	18.00
500-3	19.50
600-3	20.00

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

Neutral Oils

CALIFORNIA—		
Pale Oils:		
200-2½-3	7.00	7.75
400-3-4	7.25	8.00
600-3-4	8.75	11.00
Red oils:		
200-4-5	7.00	7.75
400-5-6	9.00	11.00
500-900, 5-6½	9.25	11.25
GULF COAST—		
Pale oils:		
200-3	8.50	8.75
300-3	9.00	9.25
500-3½	9.75	10.00
750-3½	10.00	10.25
2,000-4	10.50	10.75
3,000-4	12.25	12.50

PENNSYLVANIA—	
150 vis. at 70° F., 3 color, 400-405 flash:	
Zero pour point	37.50
10 pour point	36.50
15 pour point	35.50
25 pour point	30.00
200 vis. at 70° F., 3 color:	
Zero pour point	39.50
10 pour point	38.50
15 pour point	37.50
25 pour point	32.00

WAX

(Cents per pound)

OKLAHOMA (Group 3)—	
124-126 (A.m.p.) w.c. scale	4.250
PENNSYLVANIA (inland refineries)—	
122-124 (A.m.p.) w.c. scale	4.250
124-126 (A.m.p.) w.c. scale	4.250
NEW YORK—	
Wax in bags fully refined:	
130-132 (A.m.p.) wax	5.850
133-135 (A.m.p.) wax	6.150
Crude scale:	
124-126 (A.m.p.) w.s.	4.250
124-126 (A.m.p.) y.s.	4.250

TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

ATLANTIC AND NEW ENGLAND
(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Baltimore, Md.	15.95	5.50	10.20
Boston, Mass.	14.90	4.50	9.80
Burlington, Vt	16.90	5.50	10.10
Buffalo, N. Y.	16.20	5.50	10.60
Dover, Del	16.70	5.50	12.00
Hartford, Conn.	15.60	4.50	9.70
Manchester, N. H.	17.30	5.50	10.80
Newark, N. J.	15.20	4.50	9.70
New York, N. Y.	16.10	5.50	9.80
Philadelphia, Pa.	16.20	5.50	11.65
Pittsburgh, Pa.	16.70	5.50	12.00
Portland, Me.	16.30	5.50	9.90
Providence, R. I.	15.00	4.50	9.60
Washington, D. C.	15.20	4.50	11.00
Average 14 cities	16.02	5.14	10.49

(All prices undivided dealer basis.)

CENTRAL
(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co., and Texas Co)

	Dealer tank wagon	Combined tax	Kero tank wag
Chicago, Ill.	13.40	4.50	10.30
Cleveland, Ohio	15.00	5.50	*9.00
Dallas, Tex.	13.00	5.50	7.00
Des Moines, Iowa	14.40	4.50	9.80
Detroit, Mich	14.40	4.50	9.60
Fargo, N. D.	16.90	5.50	11.30
Huron, S. D.	16.30	5.50	10.70
Indianapolis, Ind	15.20	5.50	9.80
Little Rock, Ark.	17.50	8.00	10.00
Milwaukee, Wis.	16.10	5.50	10.50
Minneapolis, Minn.	15.40	5.50	10.30
Omaha, Neb.	15.40	6.50	9.80
Tulsa, Okla.	16.50	7.00	8.50
Wichita, Kans.	12.70	4.50	8.00
Average 14 cities	15.15	5.57	9.61

*Includes 1-cent state tax.

SOUTHEASTERN
(Standard Oil Companies of New Jersey, Kentucky, and Louisiana)

	Dealer tank wagon	Combined tax	Kero tank wag
Atlanta, Ga.	18.90	7.50	*11.50
Birmingham, Ala.	18.50	8.50	9.00
Charleston, S. C.	18.95	7.50	.....
Charleston, W. Va.	19.25	6.50	13.30
Charlotte, N. C.	20.10	7.50	11.30
Jacksonville, Fla	18.90	8.50	9.50
Jackson, Miss.	17.50	7.50	†9.00
Louisville, Ky.	16.50	6.50	8.50
Memphis, Tenn.	17.90	8.50	10.50
New Orleans, La.	17.75	8.50	*10.00
Norfolk, Va.	17.45	6.50	12.00
Average 11 cities	18.34	7.50	10.46

*Includes 1-cent state tax.
†Includes ½-cent state tax.

MIDWESTERN
(Continental Oil Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Albuquerque, N. M.	17.50	7.50	10.00
Boise, Idaho	20.10	6.50	16.50
Casper, Wyo.	17.00	5.50	12.00
Denver, Colo.	14.50	5.50	11.00
Helena, Mont.	17.00	6.50	13.00
Phoenix, Ariz.	18.50	6.50	12.50
Reno, Nev.	17.50	5.50	13.50
Salt Lake, Utah	18.50	6.50	14.50
Average 8 cities	17.58	6.25	12.88

PACIFIC COAST
(Standard Oil Co. of California)

	Dealer tank wagon	Combined tax	Kero tank wag
Portland, Ore.	17.00	6.50	13.50
San Francisco, Calif.	14.50	4.50	11.50
Seattle, Wash.	17.00	6.50	13.50
Average 3 cities	16.17	5.83	12.83
Average 50 cities	16.35	5.96	10.76

Equipment Progress

BEAUMONT IRON WORKS AWARDED "E" PENNANT

On March 25 at a colorful ceremony in the company's plant at Beaumont, Tex., Beaumont Iron Works Co. was the recipient of the coveted Army-Navy "E" award.

Army and Navy officials present "E" pennant to Beaumont Iron Works Co. Left to right: Read Adm. P. W. Foote, U.S.N., retired; John W. Baer, veteran employe; Col. Royden Williamson, U.S.A., and A. I. Brainard, president, Beaumont company

Presentation of the "E" pennant was made to Pres. A. I. Brainard by Rear Adm. P. W. Foote, U.S.N., retired, inspector of naval material.

Col. Royden Williamson, representing Maj. Gen. Richardson Donovan, U.S.A., presented "E" pins which were accepted in behalf of the employes by John W. Baer, a welder in the company's plant, whose son was lost in the Solomons battle.

P. B. Doty, president of the First National Bank of Beaumont, gave the principal address, tracing the 33 years of growth of Beaumont Iron Works Co. from a modest machine shop in early Spindletop days to its present modern steel foundry and manufacturing plant with hundreds of employes engaged in producing war material.

New Line of Feeders

% Proportioneers, Inc. %, Providence, R. I., have recently added a new series of Midget Adjust-O-Feeders to their line of proportioning pumps. These pumps contain many novel design features such as straight through drive shaft which permits operating up to eight units from a single central motor and a fully enclosed support frame which presents a pleasing appearance as well as protecting the moving parts from dust and dirt and eliminating the necessity of guards.

The Midget Adjust-O-Feeder is available in either plunger or diaphragm type, and plunger units range in capacities from 0 to 10 g.p.h. When equipped with Bakelite or plastic cylinders, pumps are capable of discharging against pressures ranging from 0 to 150 lb. With stainless or iron cylinders, pressures up to 1,000 lb. can be safely handled. Both plastic and metallic measuring cylinders have built-in check valves. The former has rubber or neoprene face disks and the latter is equipped with balls.

All plunger-type Adjust-O-Feeders are equipped with %Proportioneers% fluid sealed stuffing gland for hard-to-handle and corrosive fluids. The fluid seal encloses all moving parts in a flowing water bath, soap solution or a neutral oil, depending upon the job conditions.

Diaphragm-type Midget Adjust-O-Feeders are built in capacities ranging from 0 to 7½ g.p.h. and for pressures from 0 to 100 lb. Diaphragms are preformed reinforced neoprene, and as no stuffing gland is required, the fluid seal is omitted. Diaphragm heads are of "see-through" plastic with built-in suction and discharge check valves having sight feed domes.

Changes in displacement are made through neutralizing eccentrics, one of which is movable and the other fixed. The movable eccentric carries a scale in small increments from 0 to 10, and changes in throw are made by means of special screwdriver furnished with each pump.

Chicago Bridge Pacific Coast Yard Awarded Army-Navy "E"

The Pacific Coast yard of Chicago Bridge & Iron Co. at Eureka, Calif., was advised on February 12, 1943, that its employes would receive the Army-Navy Production Award for outstanding performance in wartime construction. Presentation ceremonies were held at the yard on February 27.

Comdr. Harry A. Shawk, commandant of the Eureka Section Base, represented the U. S. Navy and made formal presentation of the award. Lieut. Col. Donn Austin, Cavalry, represented the Army and presented token pins to employe representatives. Charles S. Pillsbury, vice president, accepted the award on behalf of the company. L. A. Elsener served as chairman during the presentation program. Donald E. Larson is general manager of the Eureka yard.

The award also included the local employes of Mercer Fraser Co., subcontractors on facilities at the yard.

Trade Literature

Lincoln Electric Co., Cleveland, Ohio.—A new 42-page booklet entitled "Factors Affecting Increased Welding Production." Fifteen sections contain up-to-date information on specific phases of arc welding. The booklet is profusely illustrated and contains many charts and tables helpful in choosing correct electrode, applying most suitable welding technique, estimating speeds and costs of various welding jobs, and other data that will produce the best possible results, reduced costs and increased production.

National Airoil Burner Co., 1284 East Sedgley Avenue, Philadelphia, Pa.—Bulletin 65, describing low-air-pressure oil burner and Airovent centrifugal blowers. The burners are made in seven sizes, and are designed to meet the exacting and severe conditions required for firing all types of metal working, heat treating, metal

melting and other types of process furnaces.

Air Reduction Co., 60 East Forty-second Street, New York, N. Y.—"The Welding of Piping," a practical treatise of 16 well-illustrated pages. Its material consists of a series of articles prepared by the company's applied engineering department. It comprehensively covers various types of ferrous and nonferrous piping, their dimensions, fabrication, and estimates of welding and labor costs.

COMMISSION MAKES "M" AWARD TO EDWARD VALVE

The U. S. Maritime Commission's maritime "M" pennant, Victory Fleet flag and labor merit badges were presented March 13 to the employes of Edward Valve & Manufacturing Co., Inc., East Chicago, Ind., by Commissioner Thomas M. Woodward.

Featured with Commissioner Woodward at the presentation ceremonies which were held at the company's East Chicago plant, were Henry F. Schricker, governor of Indiana, and Rear Adm. Edward E. Evers, U.S.N.

Commissioner Woodward said the award was in recognition of the "unfailing ability of the Edward company to meet contracts with the Maritime Commission on schedule or ahead of schedule."

W. F. Crawford, president of the company, accepted the "M" pennant, and James C. Benson, veteran mechanical inspector, accepted the labor merit badges on behalf of the employes.

The Edward plant is a pioneer builder of cast and forged steel valves, and in addition to its Maritime Commission work, is also producing for the Army, Navy, Lend-Lease, petroleum, synthetic rubber and other war projects.

Commissioner Thomas M. Woodward presents U. S. Maritime Commission's "M" pennant for outstanding production to W. F. Crawford, president; Edward Valve & Mfg. Co. Left to right: Commissioner Woodward; Rear Admiral Edward E. Evers; Lieut. Col. C. L. Jordan; Maj. F. W. Renwick; Gov. Henry F. Schricker of Indiana, and Mr. Crawford

Among Equipment Men

Knox Elected President Of Bucyrus-Erie Co.

Bucyrus-Erie Co., Milwaukee, Wis., announces the election of N. R. Knox as president, succeeding W. W. Coleman, who has been president for 32 years and who will remain as chairman of the board of directors. Mr. Knox has been vice president of the company since 1933, in charge of the plants in South Milwaukee, Erie, Pa., and Evansville, Ind.

G. A. Morrison, vice president, was elected vice chairman of the board, and W. L. Little, works manager, was named vice president.

Bethlehem Supply Co. Names Distributor

Bethlehem Supply Co., a subsidiary of Bethlehem Steel Corp., announces the appointment of Petroleum Equipment Co., Los Angeles, Calif., as its Pacific Coast distributor of Bethlehem pumping units.

Morse Heads Sales for Fairbanks-Morse

Fairbanks, Morse & Co. announce the appointment of Robert H. Morse, Jr., as general sales manager. Mr. Morse comes to his new duties with a long and varied experience, beginning in 1916, in the service of the company and its subsidiaries. This experience includes 10 years in the manufacturing divisions, followed by extensive sales experience as manager successively of the Cincinnati, Ohio; Dallas, Tex., and Boston, Mass., branches, and the stoker division; and more recently as assistant sales manager.

He enlisted in the regular Army in 1917 and saw considerable experience in France during the first World War. He was married in 1920 and has three children. His oldest son, R. H. Morse, III, is now serving as an ensign in the U. S. Naval Reserve.

Advertising Agency Change

The advertising firm of Wallace Davis & Co., 617 Caroline Street, Houston, Tex., on March 1 was changed to Davis-Dyke & Co. Wallace Davis and Frank Dyke are now partners in the business. They have both specialized in the preparation of advertising for oil-country products.

Patton Heads Tubular Exchange Group

Cuyler S. Patton, manager of sales for Alco Products division of American Locomotive Co., was elected president of the Tubular Exchanger Manufacturers Association at the annual meeting of the association held in New York City.

Mr. Patton has been prominent in the activities of the association for many years and has served several terms on its executive committee The association has materially contributed to the war effort through standardization of tubular equipment designs and is very active in promoting increased production of these items vital to war industry.

Mr. Patton was graduated from Cornell University in 1918 with the degree of mechanical engineer. He has been with the American Locomotive company since 1929.

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED RATE

8 CENTS A WORD, minimum charge $2 per insertion.

SITUATIONS WANTED, 4 cents a word, minimum charge $1.

BOX NUMBERS, count 9 words when replies are to be sent to our Tulsa Office.

10% DISCOUNT if 3 insertions are ordered at one time, with check accompanying order.

All classified advertising payable in advance.

DISPLAYED—PER INCH

Classified display advertising set in single or double column style:

1 inch	1 time	$7.00
1 inch	13 times	6.50
1 inch	26 times	6.00
1 inch	39 times	5.50
1 inch	52 times	5.00

Rates are governed by total space used within 12 months from date of first insertion. Credits are allowed when lower rates are earned.

FORMS CLOSE MONDAY NOON—PUBLISHED EACH THURSDAY

EQUIPMENT WANTED

WANTED: Well servicing units in good condition. All makes and sizes considered. We pay cash. Melton Supply Co., Seminole, Okla.

WANTED: Truck load quantities, or more, of used small pipe, black and galvanized, ½", ¾", 1", 1¼" and 1½", shopped or unshopped. Advise price and location. CENTRAL PIPE & SUPPLY CO., 2611 Avenue H, Lubbock, Texas.

DIESEL ENGINES WANTED

1500 HP in one or more units with or without Generators. Single unit preferred. Give full information. Box B-418, The Oil and Gas Journal, Tulsa, Okla.

REFINERIES as a whole or in part. Tanks, High Pressure—Atmospheric and Crude Oil Storage, Horizontal or vertical—Boilers—Stills—Bubble Towers—Fractionating Towers—Condensers—Heat Exchangers—Valves—Casings—Line Pipe—Boiler Tubes—Diesel Engines—Bulldozers—Turbines—Draglines—Shovels or what have you for sale? Send Complete Information, price and description. FALLS CITY SALES CO., Phone: Jackson 0189, Box 776, Louisville, Ky.

WANTED: Complete plants to dismantle. Steel storage tanks. Steel buildings. Pipe lines and tank plates in any condition. NATIONAL STEEL & EQUIPMENT CO., 3800 Tulane Avenue, New Orleans, La.

WANTED

Abandoned Pipe Lines, in or out of the ground, Oil Wells, Steel Buildings and Steel Storage Tanks of all sizes.

JOS. GREENSPON'S SON PIPE CORP.

National Stock Yards, St. Clair Co., Illinois.

EQUIPMENT FOR SALE

STEAM DRIVEN LIGHTING PLANT for Sale: G. E. Multiplar Generator, 110 Volts, 261 Amps. Direct connected Steam driven, Switch board and all complete and in A-1 condition. Price $1,500 f.o.b. Morgantown, W. Va. Address Maj. L. H. Jones, % B. M. Chaplin, 211 Race St., Morgantown, W. Va.

4—8,000 gal. gasoline storage tanks. 1—200 cubic ft. Portable Sullivan Motor driven Air Compressor. 1—15 HP 1200 RPM, 220 Volt, 3 Phase 60 cycle electric motor. O.K. PIPE & SUPPLY CO., 1110 S.E. 29th St., Oklahoma City, Okla.

EQUIPMENT FOR SALE

QUICK AND RELIABLE SERVICE — If you want to buy or sell industrial machinery and equipment, steel buildings, tanks, etc., wire or phone us. INDUSTRIAL SUPPLY & EQUIPMENT CO., INC., 1044 Canal Bldg., New Orleans, La.

PRESSURE vessels 12 feet by 42 feet, 15 feet by 42 feet, 16 feet by 42 feet, 110 pound working pressure. Can furnish drawings and invite inspection. Address Power Construction Co., 216 Hodgson, Minneapolis, Minnesota.

162—3½" OD—6½" Centers—Chrome Key Headers

30—Pieces 3½" ID—4" OD—21' to 28' Long—Chrome Tubes

120—Pieces 3" ID—3½" OD—30' Long—Chrome Tubes

1—½" Shell 5'x74'—4000 barrel cap. Crude Oil Fractionator with Trays

30—Pumps, various sizes and types

A. C. BARTSCH
BOX 127 FOREST PARK, ILL.

FOR SALE:

300—13" OD, 8 thread, new casing couplings

1—Gasoline Power Drilling Rig good for 3000'.

Also Steam Drilling Rigs and pipe and casing of all sizes.

We also purchase abandoned Leases, Refineries, pipe lines and other oil field equipment.

If in need of material or have material for sale, communicate with

Louisiana Iron & Supply Co.
Shreveport Louisiana
Phone 5223 or L.D. 1

EQUIPMENT FOR SALE

WAR

WHAT IT TAKES TO WIN
MANPOWER AND EQUIPMENT
The following critical materials being offered for sale and immediate delivery:
18 STEEL BUILDINGS, CONSISTING OF 250,000 SQ. FT. OF AREA, LOCATED AT
EGYPT, PA.
EASTON, PA.
NORTHAMPTON, PA.
NEW CASTLE, DEL.
MANY EQUIPPED WITH CRANE RUNWAYS FOR HEAVY DUTY
37 LARGE OIL STORAGE TANKS UP TO 35,000 BARREL CAPACITY, LOCATED IN NORTHERN OHIO.
Are in Position to Dismantle, Match-Mark and Load Buildings or Tanks
3200 TONS OF STRUCTURAL STEEL, MISC. LENGTHS. PRIME CONDITION, AVAILABLE FOR IMMEDIATE DELIVERY. LOCATED IN CENTRAL OHIO.
HAVE AVAILABLE IN PHILADELPHIA, PA., 1500 TONS OF STRUCTURAL STEEL, ALL SIZES AND SHAPES, INCLUDING TRUSSES AND GIRDERS.
For Information and Immediate Action
PHONE, WRITE or WIRE
PLANT & EQUIPMENT PURCHASING CO.
Fountain Square Bldg., Cincinnati, Ohio
Phone Main 2142
or
BUYERS SERVICE & ENGINEERING CO.
P.O. Box 552, West Tulsa, Oklahoma
Phone 2-4441

FOR SALE: Lufkin pumping unit suitable for 4000' well. Melton Supply Co., Seminole, Okla.

FOR SALE BARGAIN

10—81' Lee C. Moore Tubular Pumping Derricks complete. Galoob Iron & Metal Co., Box 372, Phon 289, Healdton, Okla.

PORTABLE "Mud-Hog" on skids, Union Oil Duplex pump 6¼" by 12" steel liners, Cadillac motor, strongly built—$1800.00. 340 E. Pleasant St., Long Beach, Calif.

257,000' 2" Line Pipe; 3,700' 2½" Line Pipe; 76,500' 3" Line Pipe; 23,500' 4" Line Pipe. All standard weight T&C pipe in ground. 22,000' Light Weight 6" OD Line Pipe. In stock for immediate shipment. Utility & Industrial Supply Company, Jackson, Michigan.

FOR SALE: Used Portable Rotary, Star K type and 45 Supertractor spudders, WL Waukesha and P300 International Skid Engines, 24 KW DC Electric Generator, 30 HP Oil Well Chain mounted Boiler. The Star Drilling Machine Co., Chanute, Kansas.

1—600 Gallon overhead Storage Tank $550.00
2—10 x 20 Overhead Tanks, $800.00 Each
1—5600 Gallon Vertical Tank, $450.00.
Tesco Service Station Equipment Co., Box 1747, Abilene, Texas.

500 tons of cable tools at a big saving. You can pick what you want.

DEGEN PIPE & SUPPLY CO.
401 No. Boston
Phone 3-2329 Res. 6-4736
Tulsa, Okla.

FOR SALE

One steam drilling rig complete with 4 and 6 inch drilling pipe. Ready to move on location. This rig is practically brand new. Capable of drilling 12,000 ft. A bargain.

One steam drilling rig complete with 4 and 6 inch drilling pipe. Ready to move on location. Good condition. Bargain.

Also 9,000 ft. 2½ inch and 2,000 ft. 2 inch line pipe.

Complete inventory will be furnished upon request.

FRANK & FRED JONES DRILLING COMPANY
1506 Tower Petroleum Building
Dallas, Texas Phone R-1585

Classified Advertising

LEASES AND DRILLING BLOCKS

FOR SALE: Oil property and country estate located in Venango Co., Pa. 430 acres of land, timber, some coal, 21 bbls. of oil daily, no pressure used. 106 oil wells, 7 powers. Complete set of buildings for oil and farm use. Owners home furnished with antiques, etc. Address Owner, 10 West Third St., Oil City, Pa.

LEASES ROYALTIES
PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma.
Louisiana and Illinois.
20 Years' Experience
Inquiries Invited
B. D. BUCKLEY
60 Broadview Drive, Clayton
St. Louis, Mo.

LEASES AND DRILLING BLOCKS

WHY NOT FILE for government oil lease on U. S. oil reservation lands, under new law? It's opportunity. Box B-522, The Oil and Gas Journal, Tulsa, Okla.

WANTED TO PURCHASE developed producing oil properties in Kansas or West Texas. Prompt action. C. C. Harmon, Nowata, Okla.

NEW MEXICO
State Oil and Gas Leases
Forty acres and multiples thereof, in a new HoT spot. 23 oil companies own surrounding leases. Write for information. No obligation. HARRY S. WRIGHT, New Mexico State Lessee, Farmington, N. M.

5000 ACRE STRUCTURE fully geologized, geophysical, cored, equipped rotary and cable. Contractor drafted. Want deal completion. S. W. Pressey, Pueblo, Colo.

HAVE oil well, Montana; Want more drilled. Shallow. Box B-573, The Oil and Gas Journal, Tulsa, Oklahoma.

California

(Continued from Page 150)

LOS ANGELES BASIN

Los Angeles County.—Long Beach Oil Development Co. removed all doubt about the productivity of the so-called tar sand in the Wilmington field by completing 14-X flowing 450 bbl. of clean 14.6-gravity oil per day from 2,237 ft.

The Terminal section of the Wilmington field contains about 35,000,000 bbl. of heavy crude oil in the tar sand. It is estimated there is an additional total of 15,000,000 bbl. of heavy oil undeveloped in the tar sand outside the Terminal area. Operators in the Terminal section of the Wilmington field more than a year ago petitioned PAW for authority to drill a number of tar-sand wells on the basis of one well to not less than 10 acres but were refused authority. Operators feel that one well to 10 acres is necessary to adequately develop the tar sand which produces a viscous oil. Some feel that one well will not drain over 5 acres.

Buena Park, Orange County: Texas Co. 5-1-J Buena Park, 31-3s-10w, abandoned T.D. 9,577 ft., bottomed in conglomerate.

Corona Del Mar wildcat district, Orange County: Signal Oil & Gas Co. 1 Irvine, 6-7s-9w, abandoned, T.D. 1,900 ft.

Huntington Beach, Orange County: D. D. Dunlap 19 H. B., 36-5s-11w, pumped 76 bbl., 19.1-gravity, 2 per cent cut, T.D. 4,010 ft., perf. 3,957-97 ft., M point 3,929 ft., started off pumping all water, then cleaned up, completed in Huntington zone, Miocene.

Southwest Exploration Co. 50 State, 4-6s-11w, flowed 217 bbl., 23.2-gravity, 2 per cent cut, 16/64-in. bean, pressures 150/675 lb., T.D. 4,915 ft., perf. 4,373-4,915 ft., started off pumping, began flowing 2 days later, completed in Huntington tidelands by directional drilling, Miocene.

Torrance, Los Angeles County: Wood-Callahan Oil Co. 4 Dominguez estate, 5-4s-14w, pumped 40 bbl. net, 15.2-gravity, 10 per cent cut, T.D. 3,664 ft., gravel packed perf. 3,232-3,662 ft., completed in Ranger zone, Pliocene.

Yorba Linda, Orange County: Shell Oil Co. 66-16 Olinda fee 4, 16-3s-9w, flowed 376 bbl., 19.1-gravity, 2 per cent cut, 100,000 cu. ft. gas, 26/64-in. bean, pressures 150/625 lb., T.D. 2,225 ft., perf. 1,994-2,060 ft., 2,129-2,222 ft., completed in Olinda zone, Miocene.

COASTAL DISTRICT

Santa Barbara County.—Tide Water Associated Oil Co. has concluded drilling operations on 1 Chamberlain in the Zaca Creek district at 5,194 ft. and has started pumping operations. The well has been producing some fluid but it is too early to tell whether it is injected fluid or formation oil. The company found a heavy tar sand higher up in the hole which could not be produced without injecting light oil to reduce the viscosity. The lower part of the hole looks far more promising and the company may therefore develop commercial production. This is the second well drilled at Zaca Creek as the original hole failed to find the pay.

Canadian Fields

(Continued from Page 161)

daily for the corresponding week last year. The daily average included 24,936 bbl. of crude and 1,330 bbl. of natural gasoline from Turner Valley and 296 bbl. of crude from outside fields.

February production.—Crude petroleum and natural-gasoline production from Alberta in February totaled 757,158 bbl. or 27,041 bbl. daily, a decrease of 75 bbl. in the daily average from January 1943, and of 2,729 bbl. from the February average last year. The February 1943 production from Turner Valley was 711,628 bbl., including 405 bbl. shallow crude, 5,082 bbl. from limestone gas wells and 706,141 bbl. from limestone oil wells. Natural-gasoline recoveries added 37,257 bbl. Production from other Alberta fields was: Red Coulee, 746 bbl.; Vermilion, 1,462 bbl.; Wainwright, 1,392 bbl.; Del Bonita, 95 bbl.; Lloydminster, 105 bbl.; Taber, 4,473 bbl. The Taber production came from the Dominion (Standard of British Columbia) discovery well, which was the largest producer outside Turner Valley, averaging around 160 bbl. daily.

Leo Ranney Forms Company For Horizontal Drilling

COLUMBUS, Ohio.—Formation of a corporation under the name of the Ranney-Swinnerton Engineering Co., for the purpose of carrying on research work in connection with the use of the horizontal drilling, was being completed here this week by Leo Ranney of Franklin, Pa., and Morro Bay, Calif.

Incorporators of the company include Mr. Ranney, Zoe Crego, secretary to Mr. Ranney, and Gale R. King, also an attorney and partner of Mr. Ranney.

Mr. Ranney has an international reputation in the drilling field as an inventor, geologist and an exponent of horizontal drilling for water and oil. He has been active in various parts of the United States and many foreign countries extending from Alaska to Portugal and England and in South America.

Crude-Oil Prices

Representative selected crude prices from all sections of the country appear below:

East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas*	1.08

*No change since 5-21-41.

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	...	...	
19-19.9	.84	...	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	...	1.07	1.30	.94
32-32.9	...	1.09	1.32	.96
33-33.9	...	1.11	1.34	.98
34-34.9	...	1.13	1.36	1.00
35-35.9	...	1.15	1.38	1.02
36-36.9	...	1.17	1.40	1.04
37-37.9	...	1.19	1.42	1.06
38-38.9	...	1.21	1.44	1.08
39-39.9	...	1.23	1.46	1.10
40 and above	...	1.25	1.48	1.12

*Includes Lea County, New Mexico.

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Journalisms:

INTEREST in the possibilities of oil from shale is increasing rapidly. Whether this oil will become available next year or 10 years from now is a subject of considerable debate. Unfortunately, much of this debate is based on information made available many years ago and few recognize that important changes in mining and refining methods may have greatly modified the possibility of utilizing oil shales. B. H. Weil and Whitney Weinrich of Gulf Research & Development Co. have made an exhaustive study of all of the literature on the subject and their report has been made available for Journal readers. The first part will appear in next week's Engineering and Operating Section.

B. H. WEIL

WHITNEY WEINRICH

B. H. WEIL is head of the information section of the chemistry division of the Gulf Research & Development Co. He received his undergraduate training in chemical engineering at the University of Missouri and, as a Wisconsin Alumni Research Foundation scholar, was granted his M.S. in that subject by the University of Wisconsin. He was employed by the process department of the chemistry division of Gulf Research in September 1940 and has been in charge of technical information for the chemistry division as a whole since October 1942.

WHITNEY WEINRICH, at present employed by the Government in connection with the war effort, was head of the process department of the chemistry division of Gulf Research from April 1935 until January 1943. His undergraduate work in chemical engineering was done at the University of Hawaii and at the Massachusetts Institute of Technology, where he also received an S.M. in chemical engineering practice in 1931. Prior to employment by Gulf Research, he worked on the white-sugar committee of Alexander and Baldwin in Hawaii, for the refinery technology division of the Gulf Refining Co. in Philadelphia, and as Industrial Fellow of the Mellon Institute in Pittsburgh.